SOIL SURVEY OF

Jefferson County, West Virginia

United States Department of Agriculture
Soil Conservation Service
In cooperation with
West Virginia Agricultural Experiment Station

Issued February 1973

Major fieldwork for this soil survey was done in the period 1962–67. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1967. This survey was made cooperatively by the Soil Conservation Service and the West Virginia Agricultural Experiment Station. It is part of the technical assistance furnished to the Eastern Panhandle Soil Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased, on individual order, from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Jefferson County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have a slight limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions in the section "Use of the Soils as Woodland."

Foresters and others can refer to the section "Use of the Soils for Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of Soils for Wildlife."

Community planners and others concerned with town and country planning can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Use of Soils for Town and Country Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation, Morphology, and Classification of Soils."

Newcomers in Jefferson County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County."

Cover: **Weikert-Berks soils of Association 8 are in the foreground and the Edgemont soils of Association 9 are on the mountain in the background.**

U S GOVERNMENT PRINTING OFFICE 1973

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Contents

	Page
How this survey was made	1
General soil map	2
Soils of the Great Limestone Valley	2
1. Berks-Weikert association	2
2 Chilhowie-Opequon association	3
3 Hagerstown-Frederick-Huntington, local alluvium association	3
4. Duffield-Frankstown association	4
5. Benevola - Frankstown - Braddock association	5
6. Braddock-Landes-Ashton association	5
Soils of the Blue Ridge Mountains	5
7. Dekalb-Laidig association	5
8. Weikert-Berks association	6
9. Edgemont-Laidig-Steep rock land association	7
Descriptions of the soils	7
Alluvial land	7
Alluvial land, marl substratum	8
Ashton series	9
Benevola series	9
Berks series	10
Blairton series	11
Braddock series	12
Chilhowie series	13
Clifton series	14
Dekalb series	15
Duffield series	16
Edgemont series	17
Frankstown series	17
Frederick series	20
Hagerstown series	20
Huntington series	24
Laidig series	25
Landes series	26
Lindside series	26
Marl pit	27
Melvin series	27
Monongahela series	27
Opequon series	28
Quarries	28
Steep rock land	29
Weikert series	29
Use and management of soils	30
Managing soils for crops and pasture	30
Capability grouping	31
Estimated yields	33
Use of soils as woodland	33
Use of soils for wildlife	44
Suitability of soils for wildlife habitat elements	44
Engineering uses of the soils	45
Engineering classification systems	60
Soil properties significant to engineering	60
Engineering interpretations of soils	61
Test data	62
Use of soils for town and country planning	62
Formation, morphology, and classification of soils	63
Factors of soil formation	63
Morphology of soils	73
Processes of soil differentiation	73
Classification of soils	74
General nature of the county	75
Settlement, population, and transportation	75
Physiography, relief, and drainage	75
Water supply	76
Climate	76
Farming	78
Literature cited	79
Glossary	79
Guide to mapping units Following	81

Issued February 1973

SOIL SURVEY OF JEFFERSON COUNTY, WEST VIRGINIA

BY WILLIAM F. HATFIELD AND JOHN W. WARNER, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION

JEFFERSON COUNTY is in the eastern panhandle of West Virginia in the easternmost part of the State (fig. 1). It has a total area of 135,040 acres, or 211 square miles. In 1970, the population of the county was 21,280 and Charles Town, the county seat, had a population of 3,023.

Jefferson County is one of the best counties for farming in the state. It has a favorable growing season and fairly adequate rainfall. About three-fourths of the land is in farms. Principal farm enterprises are orchard fruits, dairy products, beef cattle, hogs, feed crops, and hay.

The rolling limestone valley makes up about four-fifths of the county. It is used primarily for farms and orchards. Wooded areas are only in small scattered patches on the farms. The area of the steep Blue Ridge Mountains, referred to locally as "Blue Ridge Mountain" or "Blue Ridge," is mostly wooded and is mainly used for recreation and homesites.

Limestone for various uses is quarried extensively. Many homes, towns, and villages are points of historic interest. A national park is located at Harpers Ferry. A Federal fish hatchery and research station is located at Leetown.

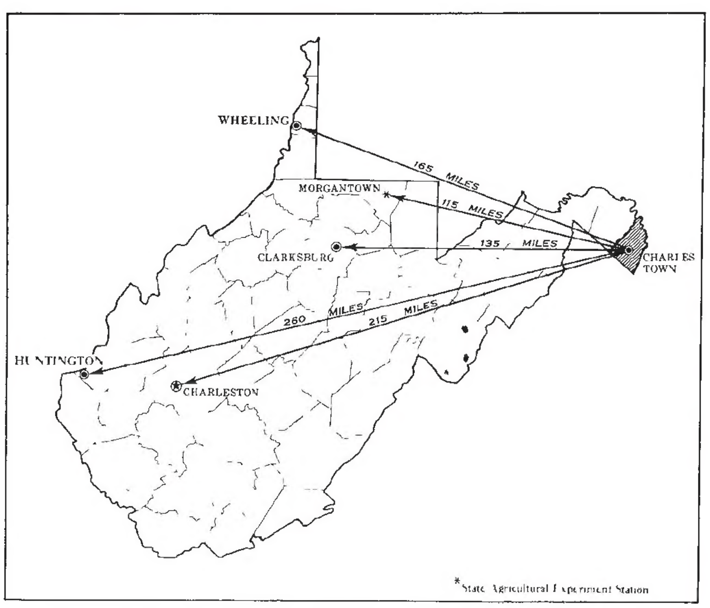


Figure 1.—**Location of Jefferson County in West Virginia.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Jefferson County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Dekalb and Duffield, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Hagerstown silt loam, 2 to 6 percent slopes, is one of several phases within the Hagerstown series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries

accurately. The soil map in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Jefferson County: soil complexes, and undifferentiated groups.

A soil complex consists of areas of two or more soils so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Berks-Weikert shaly silt loams, 6 to 12 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Hagerstown and Frederick cherty silt loams, 6 to 12 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These areas are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Steep rock land is a land type in Jefferson County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Jefferson County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The nine soil associations in Jefferson County are discussed in the following pages. The terms for texture used in the title of the associations apply to the surface layer.

Soils of the Great Limestone Valley

The Great Limestone Valley is dominated by rolling slopes that are dissected by many small drainageways. Many areas are rocky. Elevation ranges from 247 to 650 feet. Major streams are the Potomac River, Shenandoah River, and Opequon Creek. Most soils formed in residuum from folded limestone and a small amount of acid shale; however, some formed in alluvium along small drainageways, and in alluvium on terraces, and on flood plains along the larger streams.

Six soil associations are in this group. They make up about 86 percent of the county. The soils in most areas are used for orchards, cultivated crops, and hay. Perennial grasses, forbs, and scattered patches of hardwoods grow in uncultivated areas.

1. Berks-Weikert association

Moderately deep and shallow, medium-textured, dominantly gently sloping to strongly sloping soils formed in material weathered from acid shale; on uplands

This association consists of gently sloping to strongly sloping soils on uplands. Hills are rounded and smooth. This association borders the southwestern part of the county. It occupies a narrow belt adjacent to Opequon Creek.

This association makes up about 3 percent of the county. The Berks soils make up about 40 percent of the association; Weikert soils, about 35 percent; and minor soils, the remaining 25 percent.

Berks soils have a surface layer of dark grayish-brown shaly silt loam and a subsoil of yellowish-brown very shaly silt loam. They are moderately deep over shale. Weikert soils have a surface layer of very dark gray shaly silt loam and a subsoil of brown very shaly silt loam. They are shallow over shale and severely eroded in

many places. The Berks and Weikert soils are intermingled on the sides of hills.

Minor soils in this association are Huntington, Lindside, Melvin, and Alluvial land, on the flood plains; Monongahela soils on terraces; the wetter Blairton soils; and limestone-influenced Chilhowie, Hagerstown, and Opequon soils on uplands.

This association is used mainly for raising livestock. Droughtiness and low fertility limit many farm uses. Erosion has been severe on many slopes. Rapid permeability, strong slopes, and shallowness to bedrock limit these soils for many recreational and community uses. A few vacation cabins have been built along Opequon Creek, and a few idle farms are used for recreation.

2. *Chilhowie-Opequon association*

Moderately deep and shallow, fine-textured, dominantly gently sloping to strongly sloping soils formed in material weathered from limestone; on uplands

This association is dominated by gently sloping to strongly sloping soils on uplands. Slopes are short and irregular. About half of the acreage consists of soils with outcrops of limestone ledges and loose limestone fragments. The ledges are oriented northeast and southwest. This association is in two areas in the western part of the county. The larger area extends through Middleway and the smaller area is near Leetown.

This association makes up about 4 percent of the county. The Chilhowie soils make up about 65 percent of the association; Opequon soils, about 20 percent; and minor soils the remaining 15 percent.

Chilhowie soils have a surface layer of dark-brown silty clay or clay, and a subsoil of brown clay and yellowish-brown channery clay. They are moderately deep over limestone. Opequon soils have a surface layer of brown silty clay and a subsoil of yellowish-red clay. They are shallow over limestone. The Chilhowie and Opequon soils are intermingled in the very rocky areas.

Minor soils in this association are Huntington silt loam, local alluvium; Alluvial land, marl substratum, on the small flood plains; and the deep Hagerstown and Frederick on uplands.

This association is used mainly for dairy farming and for raising livestock. Areas that are not rocky are used for crops and hay. These soils are fertile, but they are droughty and are difficult to till. Many pastures are being invaded by volunteer stands of red cedar (fig. 2) The very rocky areas are limited for pasture, but they are suited to woodlots. Slow permeability, fine texture, and shallowness to bedrock limit these soils for many recreational and community uses.

3. *Hagerstown-Frederick-Huntington, local alluvium association*

Deep, medium-textured and moderately fine textured, dominantly nearly level to moderately steep soils formed in material weathered from limestone; on uplands and along drainageways

This association consists of nearly level to moderately steep soils that are cut by many intermittent drainageways. Slopes are short and irregular. About one-third of the acreage consists of soils that have outcrops of limestone ledges. The ledges are oriented northeast and southwest. Some areas that are not rocky have chert fragments on the surface. The association extends from north to south through the west-central part of the county.

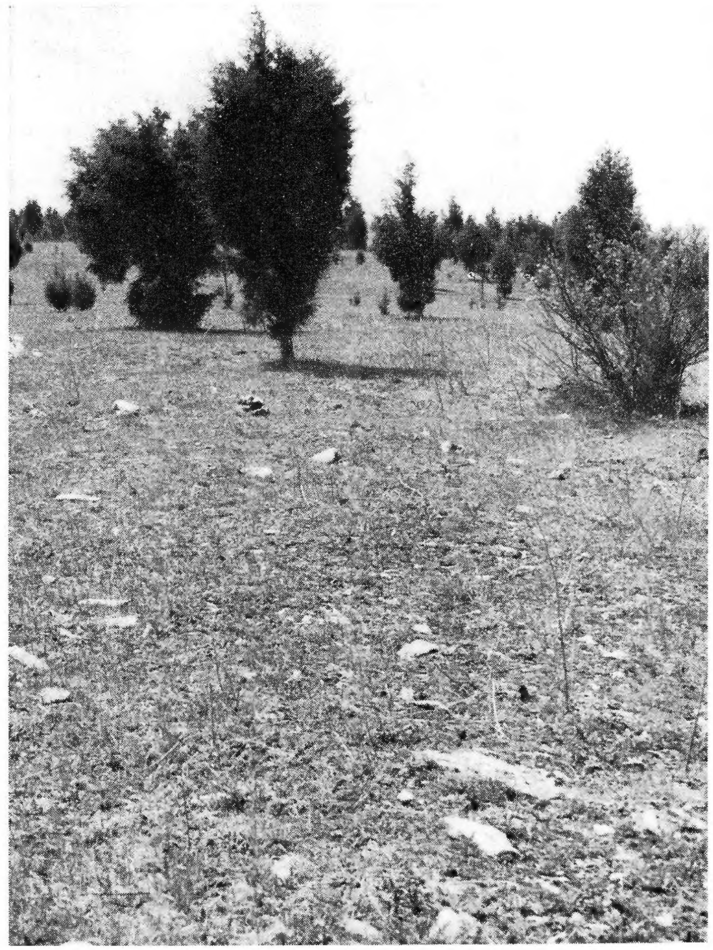


***Figure 2.*—Loose limestone fragments and volunteer stands of redcedar on Chilhowie soils.**

This association makes up about 35 percent of the county. The Hagerstown soils make up about 50 percent of the association; Frederick soils, about 25 percent; Huntington, local alluvium soils, about 10 percent; and minor soils, the remaining 15 percent.

Hagerstown soils have a surface layer of dark grayish-brown silt loam or silty clay loam and a subsoil of yellowish-red silty clay and clay. They are deep over limestone. Frederick soils have a surface layer of dark-brown cherty silt loam and a subsoil of red silty clay. They are deep over limestone and are similar to the less acid Hagerstown soils. Hagerstown and Frederick soils are intermingled in the cherty and very rocky upland areas. Huntington, local alluvium soils have a surface layer of dark-brown silt loam and a subsoil of dark-brown and dark yellowish-brown silt loam. They are deep over medium-textured or moderately fine textured material. These soils are along drainageways and formed in material washed from the surrounding uplands.

Minor soils in this association are Huntington, Lindside,

Melvin, and Alluvial land, marl substratum, on the flood plains; Braddock soils on terraces; and the less red Duffield and Frankstown on uplands.

This association is used mainly for dairy farming, for raising livestock, and for orchards. Soils that are not rocky are suited to crops and orchards; soils that are very rocky are suited to pasture; and soils that are extremely rocky are used for unimproved pastures and woodlots. The total acreage of woodland is small. Slope, a fine textured subsoil, rock outcrops, and the underlying solution caverns limit these soils for some recreational and community uses.

4. Duffield-Frankstown association

Deep, medium-textured, dominantly nearly level to strongly sloping soils formed in material weathered from limestone and limy shale; on uplands

This association consists of a series of low, parallel ridges and gently undulating soils that are dissected by small streams and drainageways (fig. 3). Many areas are shaly and some are very rocky. The association extends north to south through the center of the county.

This association makes up about 37 percent of the county. The Duffield soils make up about 50 percent of the association; Frankstown soils, about 20 percent; and minor soils, the remaining 30 percent.

Duffield soils have a surface layer of very dark grayish-brown silt loam and a subsoil of strong-brown silty clay loam. They are deep over limestone. Areas dominated by Duffield soils are smooth and free of rocks. Frankstown soils have a surface layer of dark grayish-brown shaly silt loam and a subsoil of strong-brown shaly silty clay loam. They are deep over limy shale and leached limestone. Frankstown soils are in areas having low, rounded, parallel shaly ridges and, in places, rock outcrops.

Minor soils in this association are Huntington; Lindside; Melvin; and Alluvial land, marl substratum, on bottom lands; and the redder Hagerstown and Frederick on uplands.

This association is suited to dairy farming, general farming, and orchards. Air drainage is generally good and as a result, high quality apples are grown. Strong slopes and the underlying solution caverns limit these soils for some recreational and community uses.

***Figure 3.*—Irregular topography and intermittent drainageways of the Duffield-Frankstown association.**

5. *Benevola-Frankstown-Braddock association*

Deep, fine-textured to medium-textured, dominantly nearly level to moderately steep soils formed in material weathered from limestone and limy shale on uplands and from sandstone and acid shale on terraces

This association consists mainly of strongly sloping soils that are dissected by numerous small drainageways. The landscape is smooth to irregular. Some soils have outcrops of limestone ledges or rounded gravel on the surface. The association extends in a narrow band from Bloomery to the Potomac River northwest of Harpers Ferry.

This association makes up about 3 percent of the county. The Benevola soils make up about 25 percent of the association; Frankstown soils, about 20 percent; Braddock soils, about 20 percent; and minor soils, the remaining 35 percent.

Benevola soils have a surface layer of dark reddish-brown silty clay loam or clay and a subsoil of dark reddish-brown clay. They are deep over limestone. More than half of the Benevola soils are very rocky, and some areas are severely eroded. Frankstown soils have a surface layer of dark grayish-brown shaly silt loam and a subsoil of strong-brown shaly silty clay loam. They are deep over limy shale and leached limestone. Frankstown soils are in areas having low, rounded, parallel, shaly ridges. Braddock soils have a surface layer of brown gravelly loam and a subsoil of yellowish-red clay loam. They are deep over alluvial deposits and limestone. Braddock soils formed in terraces high above the present flood plains.

Minor soils in this association are Duffield, Hagerstown, and Huntington, local alluvium. The land types Steep rock land and Quarries also are in this association. Except for Huntington, local alluvium that is along drainageways, these soils and land types are on uplands.

This association is used mainly for pasture and hay. The steeper and very rocky soils are suited to pasture and woodland. The total acreage of woodland is small. Large tracts of the association are owned by steel corporations that quarry the limestone for use as blast furnace flux. Some of the many abandoned quarries have filled with water. Strong slopes, limestone outcrops, and fine textures limit these soils for some recreational and community uses. Near the northern end of the association, along the Potomac River, several vacation homes have been built.

6. *Braddock-Landes-Ashton association*

Deep, medium-textured and moderately coarse textured, dominantly nearly level to strongly sloping soils formed in material weathered from sandstone and acid shale on terraces and from limestone on flood plains

This association consists of nearly level to strongly sloping soils on flood plains and terraces (fig. 4) along the Shenandoah River and on the inside of sharp curves along the Potomac River north of Shepherdstown.

This association occupies about 4 percent of the county. The Braddock soils make up about 45 percent of the association; Landes soils, about 20 percent; Ashton soils, about 5 percent; and minor soils, the remaining 30 percent.

Braddock soils have a surface layer of brown gravelly loam and a subsoil of yellowish-red clay loam. They are deep over old alluvial deposits and limestone and contain round gravel throughout. Braddock soils are on old terraces high above the current flood plains. Landes soils are dark brown fine sandy loam throughout. They are deep over stratified alluvial material. Landes soils are on bottom lands, and are subject to flooding. Ashton soils have a surface layer of dark-brown loam and a subsoil of brown clay loam. They are deep over stratified alluvial material. Ashton soils are similar to Landes soils, but are in slightly higher areas and flood less frequently.

The minor soils in this association are the wetter Lindside and Melvin. A few areas of the land types Steep rock land and Alluvial land also are in this association.

Most areas of the association are suited to crops or pasture. Strong slopes and the hazard of flooding limit these soils for many recreational and community uses. The association is completely rural and many areas along the rivers are used for fishing, camping, and summer homes.

Soils of the Blue Ridge Mountains

The Blue Ridge is dominated by strongly sloping foot slopes and steep uplands. Elevation ranges from 247 to 1,800 feet. The soils formed in residuum from acid sandstone, quartzite, and shale are normally stony or have prominent escarpments. The soils formed in colluvium are deeper and lack the escarpments, but many are stony.

The soils in this group occupy about 14 percent of the county. Three associations make up the group. Virtually all the soils of this group are wooded and used for vacation homesites, recreation, or have esthetic value.

7. *Dekalb-Laidig association*

Moderately deep and deep, moderately coarse textured to medium-textured, dominantly strongly sloping to moderately steep soils formed in material weathered from sandstone, quartzite, and shale; on uplands and foot slopes

This association consists of strongly sloping to moderately steep soils on uplands and foot slopes. It is in a narrow, elongated area in the foothills of the Blue Ridge. The area extends from the Virginia State line on the south, to the Potomac River north of Bolivar.

This association makes up about 3 percent of the county. The Dekalb soils make up about 65 percent of the association; Laidig soils, about 25 percent; and minor soils, the remaining 10 percent.

Dekalb soils have a surface layer of very dark gray channery fine sandy loam and a subsoil of yellowish-brown channery fine sandy loam. They are moderately deep over sandstone and contain sandstone fragments throughout. Dekalb soils are on the steeper uplands. They are rapidly permeable. Laidig soils have a surface layer of very dark grayish-brown very stony or gravelly loam and a subsoil of strong-brown sandy clay loam. They are deep over sandstone and shale and contain gravel or stones throughout. Laidig soils are on the foot slopes in material moved down from the adjacent uplands. Minor soils in this association are the shaly Weikert and Berks. The land types Steep rock land and Alluvial land also are in this association.

Most of this association has remained wooded. A few areas that were in crops are now reverting to woods.

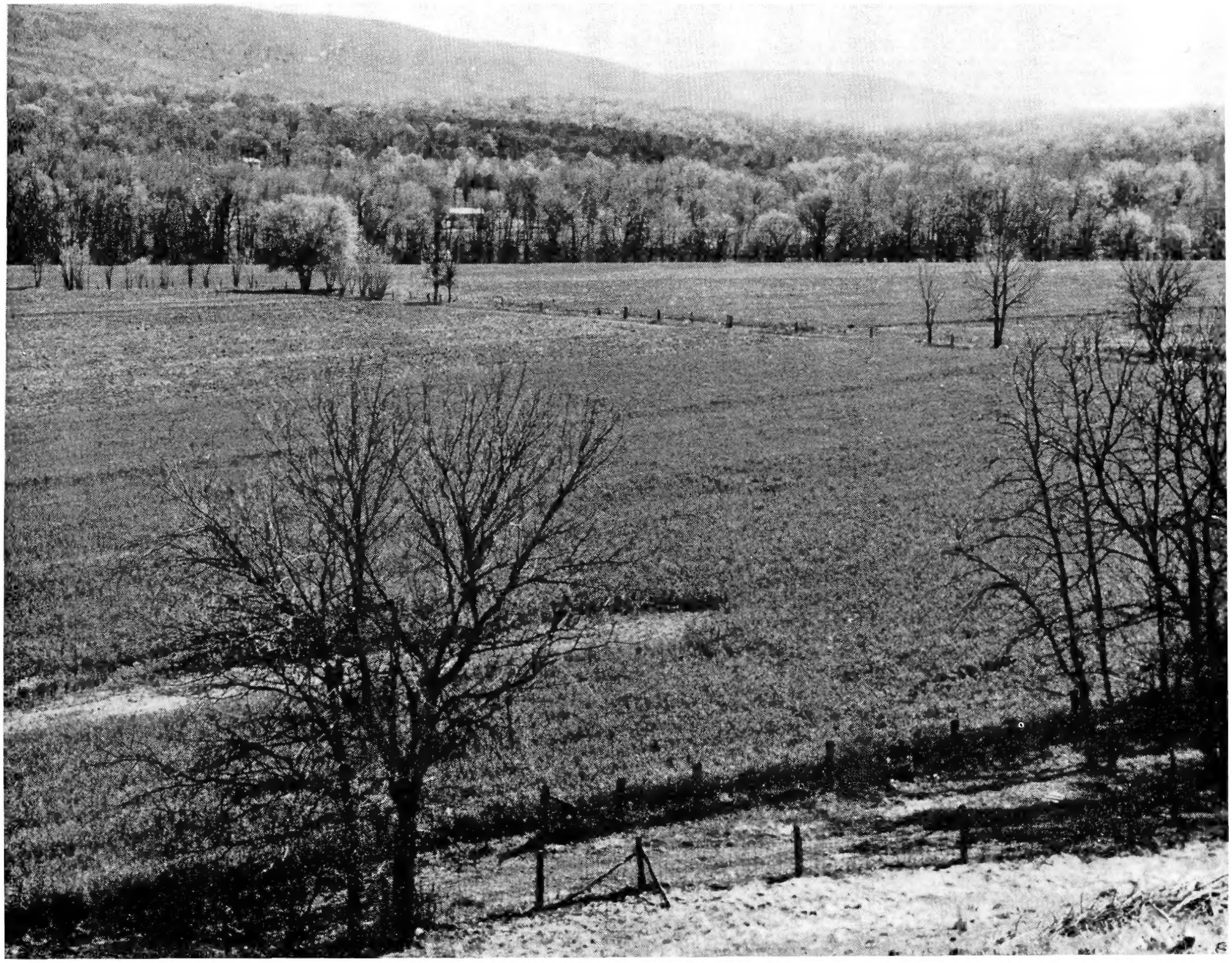


***Figure 4.*—Flood plain and terraces along the Shenandoah River.**

Steep slope, rapid permeability, stoniness, or moderate depth limit these soils for most uses. Several summer homes have been built south of State Route 9.

8. *Weikert-Berks association*

Shallow and moderately deep, medium-textured, dominantly strongly sloping to very steep soils formed in material weathered mainly from shale; on sandstone uplands

This association consists of smooth hills and strongly sloping to steeply sloping soils. Numerous intermittent streams flowing to the Shenandoah River cross the association. This association occupies a narrow elongated area parallel to Blue Ridge. The area extends from the Virginia State line to Harpers Ferry.

This association occupies about 5 percent of the county. The Weikert soils make up about 50 percent of the association; Berks soils, about 25 percent; and minor soils, the remaining 25 percent.

Weikert soils have a surface layer of very dark gray shaly silt loam and a subsoil of brown very shaly silt loam. They are shallow over shattered shale and fine grained sandstone. In many places the soils are severely eroded. Berks soils have a surface layer of dark grayish-brown shaly silt loam and a subsoil of yellowish-brown very shaly silt loam. They are moderately deep over shattered shale and fine grained sandstone. The Weikert and Berks soils are intermingled in the gently sloping to moderately steep areas.

Minor soils in this association are the Dekalb and Laidig that contain coarse fragments. The land type Steep rock land also is in this association.

Most of this association has remained wooded. A few areas were farmed, but most are now idle or reverting to

woods. Droughtiness and low fertility severely limit this association for crops and pasture. Rapid permeability, steep slopes, and shallowness to bedrock limit these soils for many recreational and community uses. Several summer homes are in this association.

9. Edgemont-Laidig-Steep rock land association

Deep, medium-textured, dominantly moderately steep to steep soils formed in material weathered from quartzite and sandstone, and rock outcrop; on uplands and foot slopes

This association consists of moderately steep to steep soils and areas of rock outcrop. It is on the sides, crests, and foot slopes of the Blue Ridge. It extends from the Virginia line to Harpers Ferry on the eastern border of the county.

This association occupies about 6 percent of the county. The Edgemont soils make up about 30 percent of the association; Laidig soils, about 25 percent; Steep rock land, about 25 percent; and minor soils, the remaining 20 percent.

Edgemont soils have a surface layer of black to brown very stony loam and a subsoil of yellowish-brown very stony sandy clay loam. They are deep over quartzite siltstone and sandstone and contain stones on the surface and throughout. Edgemont soils are on the upland face of the mountain. Laidig soils have a surface layer of very dark grayish brown gravelly loam or very stony loam and a subsoil of strong-brown sandy clay loam. They are deep over sandstone, siltstone, and shale and many areas are stony. Laidig soils are on the foot slopes in material moved down from the adjacent uplands. Steep rock land consists of bands of outcrops of sandstone and quartzite ledges along the upper slopes of the mountain. Some areas below the ledges are almost completely covered with loose boulders that have broken from the edges.

Minor soils in this association are the Clifton, which have a reddish-brown subsoil, and the Berks and Weikert, which are shaly.

Most of the association has remained wooded. Stones and boulders severely limit these soils for farm uses other than woods. Areas that are more rocky are suited to wildlife or have esthetic value. Steep slopes and stoniness limit these soils for most recreational and community uses. Several summer homes are scattered throughout the accessible areas.

Descriptions of the Soils

In this section the soils of Jefferson County are described in detail and their use and management are discussed. Each soil series is described in detail and then, briefly, each mapping unit in that series is described. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. Unless it is otherwise stated, the colors given in the descriptions are those of a moist soil, and the permeability is estimated for the least permeable horizon in the soil profile. The available moisture capacity was estimated for the upper 30 inches of the profile.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Steep rock land, for example, does not belong to a soil series; nevertheless, it is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit in which the mapping unit has been placed. The page for the description of each capability unit can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*12*).[1]

Some soil series in this county are named differently in a recently published soil survey of an adjacent county. Such differences in name result from changes in the concepts of soil classification that have occurred since publication. In some places it is more feasible to combine small acreages of similar soils that respond to use and management in much the same way, than it is to separate these soils and give them names.

Alluvial Land

Alluvial land (Ad) is nearly level. Some areas are on flood plains along small streams on foot slopes of the Blue Ridge. Other areas are near Leetown on shale, and a few areas are along the Shenandoah River. The material that makes up alluvial land washed mainly from uplands underlain by acid sandstone and shale. These deposits are young, and no readily identifiable soil has formed.

The texture of alluvial land varies within short distances because of frequent flooding and the removal and deposition of new material. This land type ranges from well drained to poorly drained. It is sandy or loamy. Areas near the Blue Ridge generally have gravel, stones, or boulders on the surface. Reaction is acid in all areas, except those along the Shenandoah River, where it is slightly acid to neutral. This land type is subject to scouring and bank erosion.

Most areas of Alluvial land are wooded, but a few areas near Leetown are in pasture or are cultivated. Poorly drained spots, frequency of flooding, and the accompanying hazard of scouring severely limit use of this land for cultivated crops. Capability unit VIw-1.

[1] Italicized numbers in parenthesis refer to Literature Cited, p 79.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Mapping unit	Acres	Percent
Alluvial land	310	0.2
Alluvial land, marl substratum	1,770	1.3
Ashton loam	290	.2
Benevola silty clay loam, 2 to 6 percent slopes	250	.2
Benevola clay, 6 to 12 percent slopes, severely eroded	150	.1
Benevola very rocky silty clay, 6 to 12 percent slopes	300	.2
Benevola very rocky silty clay, 12 to 25 percent slopes	340	.3
Berks shaly silt loam, 2 to 6 percent slopes	1,030	.8
Berks-Weikert shaly silt loams, 2 to 6 percent slopes	500	.4
Berks-Weikert shaly silt loams, 6 to 12 percent slopes	1,730	1.3
Berks-Weikert shaly silt loams, 12 to 25 percent slopes	1,240	.9
Blairton silt loam, 2 to 6 percent slopes	70	[1]
Braddock gravelly loam, 2 to 6 percent slopes	360	.3
Braddock gravelly loam, 6 to 12 percent slopes	1,100	.8
Braddock gravelly loam, 6 to 12 percent slopes, severely eroded	410	.3
Braddock gravelly loam, 12 to 25 percent slopes	660	.5
Braddock gravelly loam, 12 to 25 percent slopes, severely eroded	550	.4
Braddock gravelly loam, 25 to 35 percent slopes	140	.1
Chilhowie silty clay, 2 to 6 percent slopes	2,120	1.6
Chilhowie silty clay, 6 to 12 percent slopes	150	.1
Chilhowie clay, 6 to 12 percent slopes, severely eroded	630	.5
Chilhowie and Opequon very rocky silty clays, 2 to 12 percent slopes	1,290	1.0
Chilhowie and Opequon very rocky clays, 6 to 12 percent slopes, severely eroded	490	.4
Chilhowie and Opequon very rocky clays, 12 to 25 percent slopes, severely eroded	580	.4
Clifton very stony silt loam, 6 to 20 percent slopes	280	.2
Dekalb channery fine sandy loam, 6 to 12 percent slopes	910	.7
Dekalb channery fine sandy loam, 12 to 25 per cent slopes	930	.7
Dekalb channery fine sandy loam, 25 to 35 percent slopes	640	.5
Dekalb channery fine sandy loam, 35 to 55 percent slopes	240	.2
Duffield silt loam, 2 to 6 percent slopes	14,900	11.0
Duffield silt loam, 6 to 12 percent slopes	5,910	4.4
Duffield silt loam, 6 to 12 percent slopes, severely eroded	4,380	3.2
Duffield silt loam, 12 to 25 percent slopes, severely eroded	280	.2
Edgemont very stony loam, 6 to 25 percent slopes	1,430	1.1
Edgemont very stony loam, 25 to 50 percent slopes	1,310	1.0
Frankstown shaly silt loam, 2 to 6 percent slopes	2,470	1.8
Frankstown shaly silt loam, 6 to 12 percent slopes	2,050	1.5
Frankstown shaly silt loam, 6 to 12 percent slopes, severely eroded	3,400	2.5
Frankstown shaly silt loam, 12 to 25 percent slopes	350	.3
Frankstown shaly silt loam, 12 to 25 percent slopes, severely eroded	1,720	1.3
Frankstown shaly silt loam, 25 to 35 percent slopes, severely eroded	110	[1]
Frankstown very rocky silt loam, 6 to 12 percent slopes	870	.6
Frankstown very rocky silt loam, 12 to 25 percent slopes	430	.3
Frankstown very rocky silt loam, 12 to 25 percent slopes, severely eroded	860	.6
Hagerstown silt loam, 2 to 6 percent slopes	8,010	5.9
Hagerstown silt loam, 6 to 12 percent slopes	1,910	1.4
Hagerstown extremely rocky silt loam, 5 to 25 percent slopes	4,170	3.1
Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	1,520	1.1
Hagerstown and Frederick cherty silt loams, 2 to 6 percent slopes	8,540	6.3
Hagerstown and Frederick cherty silt loams, 6 to 12 percent slopes	4,370	3.2
Hagerstown and Frederick very rocky silt loams, 2 to 6 percent slopes	5,350	4.0
Hagerstown and Frederick very rocky silt loams, 6 to 12 percent slopes	5,700	4.2
Hagerstown and Frederick very rocky silt loams, 12 to 25 percent slopes	1,300	1.0
Hagerstown and Frederick cherty silty clay loams, 6 to 12 percent slopes, severely eroded	3,550	2.6
Hagerstown and Frederick very rocky silty clay loams, 6 to 12 percent slopes, severely eroded	2,230	1.7
Hagerstown and Frederick very rocky silty clay loams, 12 to 25 percent slopes, severely eroded	1,420	1.1
Huntington silt loam	170	.1
Huntington silt loam, local alluvium	6,970	5.2
Laidig gravelly loam, 6 to 12 percent slopes	660	.5
Laidig gravelly loam, 12 to 25 percent slopes	140	.1
Laidig very stony loam, 6 to 12 percent slopes	1,020	.8
Laidig very stony loam, 12 to 25 percent slopes	1,940	1.4
Landes fine sandy loam	1,280	1.0
Lindside silt loam	290	.2
Lindside silt loam, local alluvium	850	.6
Marl pit	70	[1]
Melvin silt loam	280	.2
Monongahela silt loam, 2 to 6 percent slopes	160	.1
Quarries	200	.1
Steep rock land	2,230	1.7
Weikert shaly silt loam, 6 to 12 percent slopes, severely eroded	1,410	1.0
Weikert shaly silt loam, 12 to 25 percent slopes, severely eroded	1,490	1.1
Weikert shaly silt loam, 25 to 45 percent slopes	1,010	.8
Miscellaneous—Towns, Roads, Water, etc	6,870	5.1
Total	135,040	100.0

[1] Less than 0.1 percent.

Alluvial Land, Marl Substratum

Alluvial land, marl substratum, (Am) is nearly level. It is on bottom lands along many small streams, mostly spring fed, that drain limestone uplands. Marl deposits are below the springs, and they extend downstream for varying distances.

The surface layer of this soil is neutral to mildly alkaline, gray to black, silt loam alluvium. It is 1 to 3 feet thick. The marl underlying the alluvium is dark gray to white. Purity of the marl varies, and thickness ranges from a few to many feet. Many of the marl deposits are used as a source for agricultural lime. This land is well drained to very poorly drained. Flooding is occasional to frequent.

Most areas of Alluvial land, marl substratum, have

been cleared. The better drained areas are used for crops and the wetter areas for pasture. Suitable outlets for subsurface drainage are lacking in many areas. In areas where drainage and flooding are not severe limitations, this land is suited to corn and pasture. The crop planting date may be influenced by flooding of the area. Frost pockets and wetness severely limit the use of this land for orchard fruits. Capability unit IIIw–1.

Ashton Series

The Ashton series consists of deep, nearly level, well-drained soils that formed in alluvium washed from limestone uplands. They are along the Opequon Creek and rivers on high bottoms that are flooded infrequently.

In a representative profile the surface layer is dark-brown loam about 10 inches thick. The subsoil extends to a depth of 45 inches and is brown clay loam. The underlying material is brown stratified clay loam, fine sandy loam, and silt loam.

Ashton soils are easy to work and are fertile. Permeability is moderate. Available moisture capacity is high. They are suited to corn, alfalfa, and other locally grown crops. No commercial orchards are on these soils.

Representative profile of Ashton loam along the cultivated west bank of the Shenandoah River, 1 mile east of Meyerstown on north side of State Route 25/5:

Ap—0 to 10 inches, dark-brown (10YR 3/3) loam; moderate, fine and medium, granular structure, very friable; many fine roots; few fine pores; slightly acid; clear, smooth boundary.

B21t—10 to 19 inches, brown (7.5YR 4/2) clay loam; dark-brown (10YR 3/3) ped faces; weak to moderate, medium, subangular blocky structure; friable, thin continuous clay films; common roots; few fine pores; slightly acid; gradual, wavy boundary.

B22t—19 to 30 inches, brown (7.5YR 4/4) clay loam; brown (7.5YR 4/2) ped faces; weak to moderate, medium, subangular blocky structure; friable but firmer than B21t; thin continuous clay films, few fine roots; slightly acid; gradual, wavy boundary.

B23t—30 to 45 inches, brown (7.5YR 4/2) clay loam; weak, fine, subangular blocky structure; friable; thin continuous clay films; few fine roots; slightly acid; gradual, irregular boundary.

C—45 to 56 inches +, brown (7.5YR 4/4) stratified clay loam, fine sandy loam, and silt loam; massive; few fine roots; few fine pores; slightly acid.

In the A horizon color ranges from dark brown to very dark grayish brown. The B horizon ranges from light silty clay loam to sandy clay loam in texture, and from brown and dark brown to dark yellowish brown in color. Solum thickness is more than 40 inches. Reaction ranges from medium acid to slightly acid.

The texture of the B horizon is slightly coarser than the defined range for the series, but this difference does not significantly alter the use and behavior of the soils.

Ashton soils are above flood plains occupied by well-drained Huntington and Landes soils, moderately well drained Lindside soils, and poorly drained Melvin soils. Ashton soils are at slightly higher levels and flood less frequently than Huntington and Landes soils.

Ashton loam (As).—This is the only Ashton soil mapped in the county. It is nearly level. Included in mapping were a few gently sloping soils and a few gravelly spots. Also included were small areas of Huntington and Lindside soils.

This soil is well suited to cultivated crops, especially corn and alfalfa. It can be farmed intensively and presents no serious management concerns. Frost pockets severely limit use for orchards. Capability unit I–6.

Benevola Series

The Benevola series consists of deep, well-drained soils. These soils formed in material weathered from limestone that contained some magnesium. They are on the eastern border of the Great Valley.

In a representative profile the surface layer is dark reddish-brown silty clay loam about 8 inches thick. The subsoil is dark reddish-brown to dark-red, sticky and plastic silty clay and clay that extends to a depth of 41 inches. Below this is gray limestone.

Benevola soils are difficult to work, but they are fertile. Permeability is moderate. Available moisture capacity is moderately high.

Small areas of Benevola soils are suited to corn, but most areas are better suited to hay or pasture. No commercial orchards are on these soils. More than one-half of the acreage contains enough limestone outcrops to severely limit tillage. Most areas are owned by steel corporations that quarry the limestone for use as blast furnace flux.

Representative profile of Benevola silty clay loam, 2 to 6 percent slopes, in pasture 2 miles east of U.S. Highway No. 340 along State Route 26:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/3) silty clay loam; strong, fine, granular structure; friable, slightly sticky when wet, many fine roots; slightly acid; clear, smooth boundary.

B21t—8 to 11 inches, dark reddish-brown (2.5YR 3/4) to dark-red (2.5YR 3/6) silty clay to clay; moderate, medium and fine, blocky structure; firm, plastic and sticky; thick patchy clay films; some material from Ap horizon in root and worm holes, many fine roots; neutral, clear, wavy boundary.

B22t—11 to 21 inches, dark reddish-brown (2.5YR 3/4) to dark-red (2.5YR 3/6) clay; strong, medium and fine, blocky structure, firm, plastic and sticky; numerous, fine, black concretions and black faces; thick continuous clay films; many fine roots; neutral; gradual, wavy boundary.

B23t—21 to 32 inches, dark reddish-brown (2.5YR 3/4) to dark-red (2.5YR 3/6) clay; strong, medium and fine, blocky structure, firm but less firm than B22t, plastic and sticky; numerous, fine, black concretions and black faces; thick continuous clay films; few fine roots; slightly acid, gradual, wavy boundary.

B24t—32 to 41 inches, dark reddish-brown (2.5YR 3/4) and dark-red (2.5YR 3/6) clay; strong, fine, blocky structure; somewhat firm, plastic and sticky; few, fine, black concretions; thick continuous clay films; few fine roots; neutral; abrupt, wavy boundary.

R—41 inches, highly weathered gray limestone that becomes hard within 2 inches.

In the A horizon color ranges from dark reddish brown to dark gray. The B horizon is dark reddish-brown to dark-red clay or silty clay. Depth to bedrock ranges from 40 to 48 inches. Reaction ranges from slightly acid to neutral.

The Benevola soils have a redder surface layer and a redder and browner subsoil than the Hagerstown soils. They are redder throughout than Duffield, Frankstown, or Frederick soils. Benevola soils contain more clay and are less acid than Braddock soils.

Benevola silty clay loam, 2 to 6 percent slopes (BaB).—This soil has the profile described as representative for the series. Most areas of this soil have gently undulating slopes. Included in mapping were nearly level areas, a few strongly sloping areas, and small, scattered, severely

eroded spots. Also included were a few limestone outcrops and narrow bands of Huntington, local alluvium soils.

This soil is suited to corn, small grain, and alfalfa. The few limestone outcrops influence the direction of tillage in some areas. Stripcropping, using sodded waterways, and keeping tillage to a minimum help to prevent runoff and erosion. Capability unit IIe-1.

Benevola clay, 6 to 12 percent slopes, severely eroded (BcC3).—This soil has a profile similar to that described as representative for the series, but most of the original surface layer has been removed by erosion, and the plow layer is more difficult to till and absorbs moisture more slowly. Also, this soil is shallower to bedrock and contains more limestone outcrops. Plowing has mixed the subsoil and the surface layer. The present surface layer is finer textured and redder than the one in the representative profile.

This soil is on the sides and points of irregular slopes. Included in mapping were gently sloping soils and a few areas of moderately steep soils.

Tillage is difficult, but this soil is suited to all crops grown in the county. In a few places limestone outcrops influence the direction of tillage. This soil is well suited to alfalfa or other long-term hay crops. Because of slope, erosion, and the danger of further erosion, good management is needed to prevent excessive losses of soil and water. Capability unit IVe-1.

Benevola very rocky silty clay, 6 to 12 percent slopes (BeC).—This soil has a profile similar to that described as representative for the series. In this soil, however, rock outcrops make up 10 to 20 percent of the acreage. These outcrops are commonly in lines, but some are in randomly spaced groups. Included in mapping were small, severely eroded, extremely rocky areas and a few moderately deep areas.

This soil is fertile, but because of rock outcrops it is suited only to pasture and trees. It is well suited to bluegrass and white-clover pasture. Machinery for mowing and fertilizing can be used in most areas. Mulching and seeding are needed on small eroded spots. Capability unit VIs-1.

Benevola very rocky silty clay, 12 to 25 percent slopes (BeD).—This soil has a profile similar to that described as representative for the series, but rock outcrops make up 10 to 20 percent of the acreage. It is commonly on breaks adjacent to the drainageways. Included in mapping were a few extremely rocky areas, a few severely eroded areas, and a few moderately deep areas.

This soil is well suited to trees, and most of it is either wooded or becoming wooded. Cleared areas are in pasture. Moderately steep slopes and rock outcrops make management of pasture difficult. Capability unit VIs-1.

Berks Series

The Berks series consists of moderately deep, well-drained soils on uplands. These soils formed in material weathered from acid shale, some thin-bedded siltstone, and sandstone. They are on smooth, slightly rounded hills and ridges near Opequon Creek that are underlain mainly by shale and on shaly hilltops east of the Shenandoah River.

In a representative profile the surface layer is dark grayish-brown shaly silt loam about 5 inches thick. The subsoil extends to a depth of 25 inches. The upper 5 inches is yellowish-brown, friable shaly silt loam; the middle 8 inches is yellowish-brown, friable very shaly silt loam; and the lower 7 inches is a strong brown, firm, very shaly silt loam. Below this is soft shattered shale.

Berks soils are easily worked, but they erode readily. Permeability is rapid. Natural fertility and available moisture capacity are moderate.

These soils are suited to small grains and hay, and most areas are in pasture or crops. Droughtiness limits suitability of the soils for corn. Most commercial orchards have been removed from these soils.

Representative profile of Berks shaly silt loam, 2 to 6 percent slopes, in a pasture 1 mile north of Leetown on State Route 3:

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) shaly silt loam; weak, fine, granular structure; very friable; many roots; many pores; 30 percent flat shale fragments up to 3 inches across; slightly acid; abrupt, smooth boundary.

B1—5 to 10 inches, yellowish-brown (10YR 5/4) shaly silt loam; weak, medium, subangular blocky structure; friable; few roots; many pores; 40 percent flat shale fragments up to 3 inches across; strongly acid; clear, wavy boundary.

B2—10 to 18 inches, yellowish-brown (10YR 5/6) very shaly silt loam; weak to moderate, medium and fine, subangular blocky structure; friable; few roots; 70 percent flat shale fragments; strongly acid; gradual, wavy boundary.

B3—18 to 25 inches, strong-brown (7.5YR 5/6) very shaly silt loam; weak, medium, subangular blocky structure; firm; few roots; 85 percent flat shale fragments; strongly acid; gradual, irregular boundary.

R—25 inches +, soft, shattered shale; silty material fills the cracks.

The B horizon ranges from shaly silt loam to very shaly silt loam, and from strong brown to yellowish brown. Shale fragments in this horizon range from about 35 to 85 percent. Depth to fractured bedrock ranges from 20 to 34 inches (fig. 5).

Berks soils are associated with the shallow Weikert soils in a mixed pattern. They are near the somewhat poorly drained Blairton soils. Berks soils also are associated with the finer textured Chilhowie and Opequon soils and the coarser textured Dekalb soils. The moderately deep Berks soils are near the deep Edgemont, Laidig, and Monongahela soils.

Berks shaly silt loam, 2 to 6 percent slopes (BkB).—This soil has the profile described as representative for the Berks series. Included in mapping were small, very shaly areas and some severely eroded areas. Also included were small spots of Blairton and Weikert soils.

This soil is suited to corn, but it is better suited to alfalfa or other deep-rooted crops. Small grains generally mature before lack of moisture becomes critical. Droughtiness limits use for orchard fruits. Choosing a suitable cropping system, using sodded waterways, contour stripcropping, and returning crop and animal residue to the soil help to prevent losses of soil and water. Capability unit IIe-10.

Berks-Weikert shaly silt loams, 2 to 6 percent slopes (BlB).—These soils occur together in such intricate patterns that it is not practical to map them separately. Berks soils make up about 50 percent of this complex and Weikert soils about 40 percent. Other soils, including the Blairton soils, make up the remaining 10 percent.

Areas of this complex are small and in many places

Figure 5.—**Profile of Berks shaly silt loam, 2 to 6 percent slopes.**

are separated by intermittent streams and strongly sloping or moderately steep breaks. Included with these soils in mapping were a few areas of Blairton soils and some very shallow spots near the breaks. Small seep spots show up during very wet weather.

About half of the acreage of this unit is used for pasture. The shallower and more shaly areas are wooded or are reverting to woodland. Only a few acres are cultivated. These soils are not suited to orchard fruits and are only moderately suited to cultivated crops. They are better suited to alfalfa and other deep-rooted perennials. Small grains generally mature before lack of moisture becomes critical. Using sodded waterways, contour stripcropping, and growing cover crops in winter help to limit losses of soil and water. Capability unit IIIe 32.

Berks-Weikert shaly silt loams, 6 to 12 percent slopes (BIC).—These soils occur together in such intricate patterns that it is not practical to map them separately. Berks soils make up about 50 percent of this complex and Weikert soils about 40 percent. Other soils make up the remaining 10 percent.

These strongly sloping soils are between gently sloping hilltops and moderately steep side slopes. Included with these soils in mapping were small, moderately steep areas and some severely eroded areas. Also included were a few very shallow areas. Small seep spots are present during periods of wet weather.

Most areas of this unit are wooded. Cleared areas generally are used for pasture. Small areas adjacent to other soils are farmed along with the adjoining soils. These soils are suited to cultivated crops, but they are better suited to long-term hay or pasture. Lack of moisture and shallowness to bedrock severely limit use for orchards. Seeding pastures in alternate strips helps to prevent losses of soil and water. Capability unit IVe-32.

Berks-Weikert shaly silt loams, 12 to 25 percent slopes (BID).—These soils occur together in such intricate patterns that it is not practical to map them separately. Except that they are shallower, each of these soils has a profile similar to that described as representative for its respective series. Berks soils make up about 45 percent of this complex and Weikert soils about 35 percent. Other soils make up the remaining 20 percent.

This unit generally is on short side slopes adjacent to drainageways and receives runoff from higher-lying ground. Included with these soils in mapping were small, severely eroded spots and a few steep areas. Also included were a few very shallow areas and a few ledges of shale or sandstone.

Most of the acreage of this unit is wooded. The soils are suited to permanent pasture, but they are not suited to row crops. If these soils are used for pasture, careful management is required for good growth and to help prevent exsessive erosion. Tall-grass pasture affords adequate pasture. Reseeding in alternate strips and maintaining drainageways in sod help to prevent excessive erosion. Capability unit VIe 31.

Blairton Series

The Blairton series consists of moderately deep, somewhat poorly drained soils on flat to slightly depressed uplands and around heads of streams. These soils formed mainly in material weathered from acid shale high in clay content. In places colluvial material has washed or rolled onto the areas from the surrounding slopes.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsoil is 24 inches thick. The upper 7 inches is mottled, brown silty clay loam; the middle 6 inches is mixed light brownish-gray and yellowish-red, slightly sticky silty clay loam; and the lower 11 inches is mixed light brownish-gray and yellowish-red, slightly sticky very shaly silty clay over shale.

Natural fertility is moderate in these soils. Permeability is moderately slow. Available moisture capacity is moderate or high.

Blairton soils are suited to crops and pasture. Wetness limits use for alfalfa and orchard fruits. Because the total acreage of Blairton soils is small they generally are farmed along with adjoining soils.

Representative profile of Blairton silt loam, 2 to 6 per-

cent slopes, cultivated, 1¼ miles southwest of Leetown on State Route 4/1:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; very friable; 5 percent flat shale chips less than 1 inch across; many fine roots; strongly acid; clear, wavy boundary.

B21t—7 to 14 inches, brown (10YR 5/3) silty clay loam; common, medium, yellowish-red (5YR 5/8) mottles; many grayish-brown (10YR 5/2) ped faces; moderate, medium, subangular blocky structure; thin patchy clay films; firm; slightly plastic and slightly sticky; 5 percent soft shale chips less than 1 inch across; common fine roots; strongly acid; clear, wavy boundary.

B22t—14 to 20 inches, variegated, light brownish-gray (2.5YR 6/2) and yellowish-red (5YR 4/8) silty clay loam; moderate to strong, medium, subangular blocky structure; firm; slightly plastic and slightly sticky; medium continuous clay films; 10 percent shale chips less than 1 inch across; few roots; strongly acid; clear, wavy boundary.

B3tg—20 to 31 inches, variegated very shaly silty clay that is about 75 percent light brownish gray (2.5Y 6/2) and 25 percent yellowish red (5YR 4/8); weak, fine and medium, subangular blocky structure; firm; slightly plastic and slightly sticky, medium patchy clay films; 60 percent shale chips up to 2 inches across; few roots; strongly acid; gradual, irregular boundary.

R—31 inches, shale

The B horizon ranges from silty clay loam to silty clay and from light brownish gray to brown. Shale content ranges from less than 5 percent on the surface to about 70 percent in the lower part of the B horizon. Depth to low chroma mottling ranges from 7 to 14 inches. Depth to bedrock ranges from 20 to 40 inches. Natural reaction is strongly acid.

The Blairton soils are slightly shallower and have slightly finer textures in the lower B horizon than the defined range for the series, but this difference does not significantly alter their use or behavior.

Blairton soils generally are surrounded by the droughty Berks and Weikert soils. They are near the Clayey Chilhowie, Opequon, and other limestone influenced soils.

Blairton silt loam, 2 to 6 percent slopes (BnB).—This is the only Blairton soil mapped in the county. Included in mapping were small areas of Berks and Weikert soils. Also included were small areas of moderately well drained soils, a few areas of nearly level soil, and a few poorly drained spots.

This soil is suited to crops and pasture. Wetness severely limits use for alfalfa and for orchard fruits. Bluegrass and tall-grass pasture are well suited. This soil is easily compacted, however, if worked or grazed when wet. In places, diversion ditches are used to intercept runoff from higher slopes. If suitable outlets are available, tile drains can be used to provide drainage in some areas. Capability unit IIIw-5.

Braddock Series

The Braddock series consists of deep, well-drained, gravelly soils. These soils formed in stream terrace deposits high above the current flood plains of the Shenandoah and Potomac Rivers. These deposits were washed from uplands dominated by acid sandstone and shale.

In a representative profile the surface layer is brown gravelly loam about 8 inches thick. The subsurface layer is yellowish-brown gravelly loam about 4 inches thick. The subsoil is about 32 inches thick and contains gravel. The upper 5 inches is reddish-brown silt loam, and the remaining 27 inches is mainly yellowish-red clay loam. It is underlain by a thick, red and strong-brown, very gravelly sandy clay loam substratum.

Available moisture capacity is moderate or high, and natural fertility is moderately low. Permeability is moderate.

Braddock soils are used for crops and pasture. No extensive commercial orchards are on this soil.

Representative profile of Braddock gravelly loam, 2 to 6 percent slopes, 1½ miles northeast of Bloomery on State Route 27:

Ap—0 to 8 inches, brown (7.5YR 4/4) gravelly loam; moderate, fine, granular structure; friable; common roots; 20 percent rounded gravel and small cobblestones up to 4 inches in diameter; neutral; abrupt, smooth boundary.

A2—8 to 12 inches, yellowish-brown (10YR 5/4) gravelly loam; weak, fine, subangular blocky structure; friable, common roots, 15 percent rounded gravel; medium acid; clear, wavy boundary.

B1—12 to 17 inches, reddish-brown (5YR 4/4) silt loam; weak to moderate, medium, subangular blocky structure; friable, few roots; 10 percent rounded gravel; strongly acid; clear, wavy boundary.

B21t—17 to 24 inches, yellowish red (5YR 4/6) clay loam; moderate, medium and fine, subangular blocky structure; firm; few roots; 10 percent rounded gravel; thin, very patchy clay films; strongly acid; clear, wavy boundary.

B22t—24 to 35 inches, yellowish-red (5YR 4/6) clay loam that has few red (2.5YR 4/6) streaks; moderate, medium and fine, subangular blocky structure; firm; few roots, 10 percent rounded gravel; medium, patchy, reddish-brown (5YR 4/4) clay films; strongly acid; gradual, wavy boundary.

B23t—35 to 44 inches, mixed yellowish-red (5YR 4/6) and red (2.5YR 4/6) light clay loam; moderate, coarse, blocky structure; firm; few roots; 15 percent rounded gravel; thin, patchy, reddish-brown (5YR 4/4) clay films; some clayey lenses; strongly acid; gradual, irregular boundary.

C—44 to 68 inches +, mixed red (2.5YR 4/6) and strong-brown (7.5YR 5/6) very gravelly sandy clay loam; massive; firm; 75 percent rounded gravel and cobblestones up to 10 inches in diameter; strongly acid.

The A horizon is mainly gravelly loam but ranges to gravelly fine sand loam. The Bt horizon ranges from sandy clay loam to clay loam, and from red to yellowish red. Coarse fragments make up 5 to 20 percent of the solum. Total thickness of the alluvial deposits range from 6 to 20 feet or more. Reaction ranges from strongly acid to medium acid; however, areas near the limestone quarries have received varying amounts of dust carried by the prevailing westerly winds and are less acid.

The Braddock soils are slightly coarser textured in the B horizon than the defined range for the series, but this difference does not significantly alter their use or behavior.

Braddock soils contain less clay and more sand than the adjoining Hagerstown, Frederick, or Benevola soils.

Braddock gravelly loam, 2 to 6 percent slopes (BrB).—This soil has the profile described as representative for the series. It is on broad flats and hilltops. Included in mapping were a few areas of severely eroded spots and some small, very gravelly areas. Also included were small areas of Hagerstown and Benevola soils.

This soil is suited to corn and alfalfa. Only a very limited acreage is used for orchards. A few of the more gravelly areas are droughty. Contour farming, sodded waterways, and use of a suitable cropping system help to control losses of soil and water. Capability unit IIe-4.

Braddock gravelly loam, 6 to 12 percent slopes (BrC).—This soil is on rolling terraces and terrace breaks. In-

cluded in mapping were small, severely eroded spots and a few very gravelly areas. Also included were small areas of Benevola soils.

This soil is suited to corn and alfalfa. A few areas contain enough gravel to interfere with tillage. Diversion ditches are needed in places that receive runoff from higher lying areas. Stripcropping, using sodded waterways, and returning crop and animal residue to the soil help control losses of soil and water. Capability unit IIIe-4.

Braddock gravelly loam, 6 to 12 percent slopes, severely eroded (BrC3).—This soil is on rolling terraces and terrace breaks. It has a profile similar to that described as representative for the series, but most of the original surface layer has been removed by erosion leaving a redder and more gravelly surface layer. This soil is slightly more droughty than most other soils in this series.

Included in mapping were small, moderately eroded areas, some moderately steep areas, and a few areas that have small, shallow gullies.

Most of this soil is in crops or pasture. It is well suited to long term hay. These soils are suited to all locally grown crops. Lack of moisture limits use for orchards. Stripcropping, diversion terraces, and sodded waterways help control losses of soil and water. Capability unit IVe-3.

Braddock gravelly loam, 12 to 25 percent slopes (BrD).—This soil is steeper than the one for which a profile is described as representative for the series. Most areas are along intermittent drainageways or on breaks above the river flood plains. Included in mapping were small severely eroded spots, some very gravelly areas, and a few limestone outcrops.

This soil is suited to corn, and is well suited to long-term hay. Where practical, diversion terraces are used to control runoff from higher lying areas. Good management helps to control runoff and erosion. Capability unit IVe-3.

Braddock gravelly loam, 12 to 25 percent slopes, severly eroded (BrD3).—This soil has a profile similar to that described as representative for the series, but most of the original surface layer has been removed by erosion. This soil is not as deep, and is more droughty, and the surface layer is redder and contains more and larger gravel than the soil described as representative for the series. Most areas are on short slopes along intermittent drainageways or on breaks above the river flood plains.

Included with this soil in mapping were moderately eroded spots, some outcropping limestone ledges, and a few areas that have shallow gullies.

This soil is suited to pasture. Most areas have been cultivated, but are now in pasture. Because of the moderately steep slopes, rapid runoff, and the hazard of erosion, this soil is not suited to crops. Capability unit VIe-2.

Braddock gravelly loam, 25 to 35 percent slopes (BrE).—This soil is on breaks above the river flood plains. Some areas have a few limestone outcrops and have larger cobblestones than the profile described as representative for the series. Included in mapping were small, moderately steep and very steep areas. Also included were small, severely eroded spots.

Nearly all of this soil is in pasture or in trees. Bluegrass or tall-grass pasture is suited to this soil. Careful management is needed to control erosion. Reseeding in alternate strips helps to reduce runoff and erosion. Capability unit VIe-2.

Chilhowie Series

The Chilhowie series consists of moderately deep, fine-textured soils that formed in material weathered from high-purity limestone. Slopes are short and irregular.

In a representative profile the surface layer is dark-brown, plastic and sticky silty clay about 6 inches thick. It contains small angular limestone fragments. The subsoil is very sticky and very plastic and extends to a depth of 16 inches. It swells when wet and shrinks when dry. The upper 4 inches is brown clay, and the lower 6 inches is yellowish-brown channery clay. The substratum is brown and yellowish-brown, sticky and plastic channery clay about 7 inches thick. Below this is limestone bedrock.

Permeability is slow or moderately slow, and available moisture capacity is low or moderate. Natural fertility is high.

Chilhowie soils are difficult to till and are droughty. Many areas are very rocky. They are used mainly for pasture.

Representative profile of Chilhowie silty clay, 2 to 6 percent slopes, in a pasture one-third mile west of Middleway near State Route 1/8:

Ap—0 to 6 inches, dark-brown (7.5YR 3/2) silty clay; moderate, medium and fine, blocky structure; firm; plastic and sticky; 10 percent limestone fragments up to 3 inches in diameter, common to many fine roots; neutral; clear, smooth boundary.

B2t—6 to 10 inches, brown (7.5YR 4/4) clay; strong, fine, blocky structure, firm; very plastic and very sticky; common fine roots; thick continuous clay films; 15 percent limestone fragments; neutral; clear, wavy boundary

B3t—10 to 16 inches, yellowish-brown (10YR 5/6) channery clay, brown (7.5YR 5/4) ped faces; moderate, medium and fine, blocky structure; firm; very plastic and very sticky; few fine roots; thick continuous clay films; 20 percent limestone fragments; few lime nodules; mildly alkaline; clear, wavy boundary.

C—16 to 23 inches, brown (7.5YR 5/4) and yellowish-brown (10YR 5/6) channery clay; massive, parting to weak, medium, subangular blocky structure; firm; plastic and sticky, 30 percent limestone fragments; many yellow (10YR 7/6) lime modules which decrease with depth, few roots; mildly alkaline; abrupt, irregular boundary.

R—23 inches +, hard blue limestone.

The B horizon is silty clay, clay, or channery analogs and ranges from dark brown to brown and yellowish brown Depth to bedrock ranges from 20 to 36 inches. Natural reaction ranges from slightly acid to mildly alkaline

Chilhowie soils have a slightly thinner, dark-colored surface horizon than the defined range for the series, but this difference does not significantly alter their use or behavior.

Chilhowie soils are associated with the redder Opequon soils in a mixed pattern. They are also associated with the deeper, redder Hagerstown and Frederick soils, the shaly Berks and Weikert soils, and the wetter Blairton soils. The Chilhowie soils are not so deep as the Monongahela soils that have a fragipan.

Chilhowie silty clay, 2 to 6 percent slopes (CdB).—This soil has the profile described as representative for the series. It is in fairly large undulating areas. Included in mapping were small, severely eroded soils and some very rocky spots. Also included were small areas of Opequon, Hagerstown, and Frederick soils.

Most of this soil is used for pasture, but some areas are in crops. This soil is suited to most locally grown crops, but is not suited to orchards. Shallowness and high clay content, however, make this soil droughty and difficult to work. A suitable cropping system, contour stripcropping, and sodded waterways help to prevent excessive losses of soil and water. Long-term hay and tall-grass pasture afford adequate protection. Capability unit IIIe–30.

Chilhowie silty clay, 6 to 12 percent slopes (CdC).—This soil has a profile similar to that described as representative for the series, but it has more shallow areas, a slightly higher content of loose stones, and a few rock outcrops. Included in mapping were small severely eroded areas and moderately steep spots. Also included were a few areas of Frederick and Hagerstown soils.

Most areas are in pasture, but this soil is suited to all commonly grown crops except orchard fruits. Depth, droughtiness, and texture limit this soil for most uses. Cultivating across the slope, returning crop and animal residue to the soil, using a suitable cropping system, and maintaining drainageways in sod help to prevent excessive losses of soil and water. Tall-grass pastures afford adequate protection. Capability unit IVe–30.

Chilhowie clay, 6 to 12 percent slopes, severely eroded (CeC3).—Most of the original surface layer of this soil has been removed by erosion. The remaining surface layer is shallower and more sticky than that of the soil described as representative for the series. Also, areas of this soil are yellower and often include more small, angular limestone fragments throughout the soil. Included in mapping were a few rock outcrops and some areas of moderately steep soils. Also included were a few small, shallow gullies.

Most of this soil has been used for crops in the past, but it is better suited to pasture or trees. Tree growth is fair. Reseeding in alternate strips and maintaining drainageways in sod help to prevent excessive erosion. Tall-grass pasture affords adequate protection. Capability unit VIe–1.

Chilhowie and Opequon very rocky silty clays, 2 to 12 percent slopes (CnC).—The Chilhowie soils in this mapping unit have a profile similar to that described as representative for the Chilhowie series. The Opequon soils have the profile described as representative for the Opequon series. Chilhowie and Opequon soils are similar, and their outcrops cause similar use and management concerns. Areas are made up of either Chilhowie or Opequon soils or both of these soils. Limestone ledges and fragments of limestone are on about one-tenth to one-fourth of the surface. These soils are in fairly large undulating areas. Included in mapping were a few areas of nearly level soils, areas of moderately steep soils, and a few small areas where the soil is not rocky.

Nearly all of the acreage of this unit is in permanent pasture, is wooded, or is reverting to wooded areas made up primarily of volunteer stands of redcedar. These soils are suitable for bluegrass and white-clover pastures, but droughtiness limits use. Except for the more rocky areas, machinery can be used for mowing and fertilizing. Mulching and seeding are needed on small spots subject to erosion. Capability unit VIs–1.

Chilhowie and Opequon very rocky clays, 6 to 12 percent slopes, severely eroded (ClC3).—These soils are strongly sloping and erosion has removed most of the original topsoil. The remaining surface layer is more plastic and more clayey than that described as representative for the Chilhowie series. Also, these soils are shallower to bedrock. Chilhowie and Opequon soils are similar, and rock outcrops and erosion cause similar concerns in use and management. Areas are made up of either Chilhowie or Opequon soils or both of these soils. Limestone ledges and limestone fragments are on the surface in about one-fourth of the areas. These soils are in small areas along the brow of the hills and on the points of the low ridges. Included in mapping were a few extremely rocky areas and spots that have shallow gullies. Also included were a few areas of gently sloping and moderately steep soils.

Most of the acreage of this unit is in pasture or is reverting to wooded areas of redcedar. These soils are not suited to pasture, however, because of droughtiness, shallowness, rockiness, and runoff. Capability unit VIIs-1.

Chilhowie and Opequon very rocky clays, 12 to 25 percent slopes, severely eroded (ClD3).—These soils are shallower than the soils described as representative for their respective series because most of the original surface layer has been removed by erosion. The remaining surface layer is very plastic and very sticky. The Chilhowie and Opequon soils in this unit are similar, and rock outcrops and erosion cause similar concerns in use and management. Areas are made up of either Chilhowie or Opequon soils or of both these soils. Limestone ledges and fragments of limestone are on the surface in about one-fourth of the areas. These soils are on moderately steep side slopes adjacent to drainageways and around the points of low ridges. Included in mapping were small extremely rocky and steep areas. Also included were a few shallow gullies. Small, loose limestone is scattered over many areas.

Most of the acreage of this unit is in crops or pasture. Many areas are reverting naturally to redcedar. Because of droughtiness and difficulties of proper pasture management, this soil is better suited to trees than to other uses. Capability unit VIIs–1.

Clifton Series

The Clifton series consists of deep, well drained soils. These soils formed in material weathered from greenstone or meta basalt near the crest of Blue Ridge.

In a representative profile the plow layer is dark-brown silt loam about 9 inches thick. The subsoil extends to a depth of 35 inches. The upper 3 inches is brown light silty clay loam; the middle 13 inches is reddish-brown, yellowish red, and brown silty clay; the lower 10 inches is reddish-brown and brown, gravelly silty clay loam. The substratum is yellowish-brown and yellowish-red silty clay loam and silt loam. Below this is greenstone schist bedrock.

Clifton soils are stony and difficult to work. Permeability is moderate. Available moisture capacity is high.

These soils are suited to pasture, but most areas are wooded or are becoming wooded. These soils are well suited to trees.

Representative profile of Clifton very stony silt loam, 6 to 20 percent slopes, on Blue Ridge, one-half mile north of the southern corner of the county near State Route 35. (Profile examined between the stones):

Ap—0 to 9 inches, dark-brown (7.5YR 4/2) silt loam; moderate, medium and coarse, granular structure; very friable; 15 percent coarse fragments up to 2 inches in diameter that have many, fine, ¼-inch greenstone chips; common fine roots; medium acid; clear, smooth boundary.

B1—9 to 12 inches, brown (7.5YR 4/4) light silty clay loam; weak to moderate, fine, subangular blocky structure; friable; 15 percent coarse fragments less than 2 inches in diameter, few fine roots; slightly acid; clear, wavy boundary.

B2t—12 to 25 inches, reddish-brown (5YR 4/4) to yellowish-red (5YR 4/6) and brown (7.5YR 4/4) silty clay; moderate, coarse and fine, subangular blocky structure; friable to firm; feels smooth and somewhat greasy; 10 percent fine greenstone chips and a few coarse quartzite grains, medium patchy clay films, common, fine, black concretions 1 to 2 millimeters in diameter, few fine roots; strongly acid; clear, wavy boundary.

B3—25 to 35 inches, variegated reddish-brown (5YR 4/4) and brown (7.5YR 4/2) gravelly silty clay loam; moderate, coarse, subangular bocky structure that parts to weak, fine, subangular blocky structure; friable; feels greasy; 20 to 25 percent fine green and black schist fragments ½ inch thick; few fine roots; strongly acid; gradual, wavy boundary.

C1—35 to 53 inches, variegated yellowish-red (5YR 4/8) and yellowish-brown (10YR 5/4) silty clay loam; massive; friable to firm; feels greasy; 5 to 10 percent fine schist chips becoming fewer with depth; strongly acid; gradual, wavy boundary.

C2—53 to 63 inches, yellowish-brown (10YR 5/8) silt loam; few yellowish-red (5YR 4/8) spots, friable to firm; few black concretions; massive; strongly acid.

R—63 inches +, olive (5Y 4/3) and dark olive-gray (5Y 3/2) greenstone schist.

The B horizon is commonly silty clay but ranges to silty clay loam. It ranges from dark brown to yellowish red. Stones, gravel, schist, greenstone chips, and coarse quartz grains range from 5 to 25 percent throughout the soil. Depth to bedrock ranges from 40 to 80 inches. Reaction in undisturbed soils ranges from strongly acid to medium acid.

Clifton soils have a slightly lighter colored surface layer than the defined range for the series, but this difference does not significantly alter their usefulness or behavior.

Clifton soils are associated with the coarser textured Dekalb and Edgemont soils that are underlain by sandstone and quartzite. Clifton soils are on uplands above the colluvial foot slopes occupied by the coarser textured Laidig soils.

Clifton very stony silt loam, 6 to 20 percent slopes (CmD).—This is the only Clifton soil mapped in the county. Included in mapping were small areas that are not stony and some very stony Laidig and Edgemont soils. Also included were a few gently sloping areas.

This soil is in isolated areas. The few areas that have been cleared are idle or are becoming wooded. This soil is suited to pasture, and the open areas can be mowed and managed. Trees grow very well, and they help in the control of erosion. Capability unit VIs-2.

Dekalb Series

The Dekalb series consists of moderately deep, well-drained, channery soils on a low ridge that parallels Blue Ridge. These sloping to steep soils formed on uplands in material weathered from sandstone that contained some interbedded shale.

In a representative profile the surface layer is thin, very dark gray channery fine sandy loam. The subsurface layer is pale-brown channery fine sandy loam about 7 inches thick. The subsoil extends to a depth of 28 inches and is mainly yellowish-brown channery fine sandy loam. The substratum is yellowish-brown or brown very channery sandy loam about 11 inches thick. Below this is sandstone.

Dekalb soils are droughty. Natural fertility is low. Permeability is moderately rapid, and available moisture capacity is moderate.

These soils are suited to corn and other crops, but most areas are wooded. Tree growth ranges from good to poor, depending on the amount and direction of slope. Some areas of these soils are used as sites for summer homes.

Representative profile of Dekalb channery fine sandy loam, 35 to 55 percent slopes in a wooded area, south on State Route 9/5 and one-half mile west at Mountain Mission:

O1—1 inch to ½ inch, loose hardwood leaves.

O2—½ inch to 0, black mull mixed with mineral material.

A1—0 to 2 inches, very dark gray (10YR 3/1) channery fine sandy loam, weak, fine, granular structure; loose; 20 percent sandstone fragments less than 6 inches long; many roots, extremely acid, abrupt, irregular boundary.

A2—2 to 9 inches, pale-brown (10YR 6/3) channery fine sandy loam; weak, fine, granular and subangular blocky structure, very friable, 20 percent sandstone fragments less than 6 inches long; many roots; very strongly acid; clear, wavy boundary.

B1—9 to 14 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) channery fine sandy loam; weak, fine and medium, subangular blocky structure; friable; 25 percent sandstone fragments less than 6 inches long; many roots, very strongly acid; clear, wavy boundary.

B2—14 to 23 inches, yellowish-brown (10YR 5/4) channery fine sandy loam (slightly finer than B1), weak, medium and fine, subangular blocky structure: firm; 35 percent sandstone fragments less than 4 inches long, common roots; strongly acid; gradual, wavy boundary.

B3—23 to 28 inches, yellowish-brown (10YR 5/4) channery fine sandy loam; very weak, fine subangular blocky structure; firm in places, 40 percent sandstone fragments less than 6 inches long; few roots; strongly acid; gradual, wavy boundary.

C—28 to 39 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) very channery sandy loam; massive or single grain; firm in places; very friable when broken out; 60 to 70 percent sandstone fragments less than 4 inches long; strongly acid; abrupt, wavy boundary.

R—39 inches +, Antietam sandstone.

The B horizon is mainly channery fine sandy loam, but ranges from loam to sandy loam. Color in this horizon ranges from light yellowish brown to dark yellowish brown. Coarse fragments are on 5 to 20 percent of the surface, and they make up more than 35 percent of the B horizon and more than 50 percent of the substratum. Depth to bedrock ranges from 24 to 40 inches. Reaction ranges from extremely acid to strongly acid.

Dekalb soils are near deeper Edgemont soils that have a slightly finer textured subsoil. They are also near the shaly Berks and Weikert soils and the deeper Laidig soils that formed in colluvium. Dekalb soils have a coarser texture than Clifton soils.

Dekalb channery fine sandy loam, 6 to 12 percent slopes (DcC).—This soil is on the crests of ridges. Included in places in mapping were extremely channery soils and stony soils and a few areas of gently sloping soils. Also included were small areas of Laidig and Berks-Weikert soils.

Nearly all of this soil is wooded. It is suited, however, to corn and other cultivated crops. Low fertility and

droughtiness somewhat limit the choice of crops. Sodded waterways, contour stripcropping, and diversion terraces help to prevent excessive losses of soil and water. Trees grow fairly well, and they help in the control of erosion. Capability unit IIIe–12.

Dekalb channery fine sandy loam, 12 to 25 percent slopes (DcD).—This soil is near the crests of ridges. Included in mapping were small extremely channery soils and stony areas.

Nearly all of this soil is either wooded or is becoming wooded. This soil is suited to crops, but its use is limited by droughtiness and low fertility. Growth of trees is good to poor, depending on aspect of the slope, but their presence provides adequate control of erosion. Capability unit IVe–5.

Dekalb channery fine sandy loam, 25 to 35 percent slopes (DcE).—This steep soil is on hillsides. Included in places in mapping were extremely stony areas. Also included were areas of Laidig soils and a few ledges of sandstone.

This soil is wooded except for small areas around summer homes. It is suited to pasture, but such use is limited by droughtiness and low fertility. It is also suited to trees. This suitability is discussed in the section "Use of Soils as Woodland." Capability unit VIe–4.

Dekalb channery fine sandy loam, 35 to 55 percent slopes (DcF).—This very steep soil has the profile described as representative for the series. Included in mapping were some sandstone ledges and very stony areas.

All of this soil is wooded. It is not suited to crops or pasture because of slope, droughtiness, and low fertility. Capability unit VIIe–2.

Duffield Series

The Duffield series consists of deep, well-drained soils. They formed in material weathered mainly from limestone that contained some silty shale. These soils are in a long area in the central part of the county. Slopes are smooth and contain a few limestone outcrops.

In a representative profile the surface layer is very dark grayish-brown silt loam about 2 inches thick. The subsurface layer is light yellowish-brown silt loam about 6 inches thick. The subsoil is 33 inches thick. The upper 4 inches is yellowish-brown silt loam, the middle 18 inches is strong-brown silty clay loam, and the lower 11 inches is strong-brown and yellowish-red shaly silty clay loam. The substratum is strong-brown and yellowish-red shaly silty clay loam about 11 inches thick.

Duffield soils are easily worked and fertile. Permeability is moderate. Available moisture capacity is high.

These soils are used mainly for crops and orchards and are well suited to those uses. Dairy farming and commercial production of corn and alfalfa are common on these soils. Several areas are irrigated.

Representative profile of Duffield silt loam, 2 to 6 percent slopes, in a wooded area 1¼ miles west of Meyerstown near State Route 21:

O1—1 inch to ½ inch, hardwood leaf litter.
O2—½ inch to 0, black, partly decomposed leaf mull
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; loose; strongly acid; abrupt, wavy boundary.
A2—2 to 8 inches, light yellowish-brown (10YR 6/4) silt loam; weak, fine, granular and very weak, thin, platy structure; friable; many roots; strongly acid; clear, wavy boundary.
B1—8 to 12 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; strongly acid; clear, wavy boundary
B21t—12 to 20 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; friable to firm; few, fine, yellowish-brown siltstone fragments, thin continuous clay films; strongly acid; gradual, wavy boundary.
B22t—20 to 30 inches, strong-brown (7.5YR 5/6) silty clay loam; common streaks and faces of yellowish red (5YR 4/6); moderate to strong, medium, subangular blocky structure: firm; slightly sticky; medium, continuous, brown (7.5YR 5/4) clay films; 10 percent fine yellowish-brown siltstone fragments; few manganese concretions and black films; medium acid, gradual, wavy boundary
B3t—30 to 41 inches, strong brown (7.5YR 5/6) and yellowish-red (5YR 4/6) shaly silty clay loam; weak, medium, subangular blocky structure, firm; medium patchy clay films; 20 percent soft siltstone fragments, medium acid. gradual, wavy boundary
C—41 to 52 inches +, strong-brown (7.5YR 5/6) and yellowish-red (5YR 4/6) shaly silty clay loam; very weak, fine and medium, subangular blocky structure; 35 percent soft siltstone fragments; thin very patchy clay films; few manganese concretions and black films, medium acid.

The B horizon is yellowish-red to yellowish-brown silt loam or silty clay loam. The B2t horizon ranges from 18 to 32 inches in thickness Depth to bedrock ranges from 4 to 7 feet. Reaction is slightly acid to strongly acid throughout the profile.

Duffield soils are associated with Benevola, Frankstown, Frederick, and Hagerstown soils. They have a thicker subsoil than Frankstown soils and contain less shale fragments. Their subsoil is coarser textured and not so red as that of Benevola, Frederick, and Hagerstown soils

Duffield silt loam, 2 to 6 percent slopes (DgB).—This soil has the profile described as representative for the series. It is in large areas and has smooth, gentle slopes. Included in mapping were small, shaly, gravelly, and severely eroded spots. Also included were a few small areas where the soil is mottled in the lower part of the subsoil and areas on which are scattered a few white quartz and sandstone fragments. Small areas of Hagerstown and Frederick soils were also included.

Most of this soil has been cultivated for many years. It is well suited to all locally grown crops. It is well suited to orchards, but frost pockets are a hazard in some areas. A suitable cropping system, contour stripcropping, minimum tillage, and sodded waterways help to prevent excessive losses of soil and water. Capability unit IIe–1.

Duffield silt loam, 6 to 12 percent slopes (DgC).—This soil has a profile similar to that described as representative for the series, but it is strongly sloping and contains a few more shale chips. Slopes are short and fairly uniform. This soil commonly is between upland divides and local drainageways. Included in mapping were areas on which are scattered a few white quartz and sandstone fragments. Also included were small areas of Hagerstown, Frederick, Frankstown, and Huntington, local alluvium soils.

Most of the acreage of this soil is in crops or orchards. This soil is well suited to all locally grown crops and to orchards. A suitable cropping system, sodded waterways, minimum tillage, and return of crop and animal residues to the soil help to prevent excessive losses of soil and water. Capability unit IIIe–1.

Duffield silt loam, 6 to 12 percent slopes, severely eroded (DgC3).—About three-fourths of the original surface layer of this soil has been removed by erosion. This soil is not so deep to bedrock as the soil described as representative for the series. Slopes are short and fairly uniform. Included in mapping were some moderately eroded spots, shaly areas, limestone outcrops, and a few areas of Hagerstown, Frankstown, and Huntington, local alluvium soils.

Most of this soil is in crops, but a small part is in pasture. It is suited to all crops, pasture, and orchards. Slope and erosion limit use. A suitable cropping system, sodded waterways, minimum tillage, and return of crop and animal residue to the soil help to prevent further erosion. Capability unit IVe–1.

Duffield silt loam, 12 to 25 percent slopes, severely eroded (DgD3).—This moderately steep soil is on short narrow breaks along drainageways. Most of the original surface layer has been removed by erosion. This soil is not so deep to bedrock as the soil described as representative for the series. Included in mapping were some moderately eroded areas, some shaly areas, and some limestone outcrops.

This soil is better suited to tall-grass or bluegrass pasture than to cultivated crops. Tall-grass pasture commonly grows well and affords adequate protection from erosion. Reseeding in alternate strips and leaving drainageways in sod help to reduce runoff and erosion where renovation is needed. Capability unit VIe–1.

Edgemont Series

The Edgemont series consists of deep, well-drained, very stony soils on side slopes of the Blue Ridge. These soils formed in material weathered from sandstone, quartzite, and siltstone.

In a representative profile, the surface layer is black very stony loam about 2 inches thick. The subsurface layer is brown very stony loam about 7 inches thick. The subsoil is yellowish brown. The upper 16 inches is very stony sandy clay loam, and the lower 4 inches is very stony sandy loam. The substratum is grayish-brown and yellowish-brown very stony sandy loam to a depth of 50 inches.

Permeability is moderate. Available moisture capacity is moderate to high, and natural fertility is moderately low.

These soils are not suited to cultivated crops or pasture because of stones and slopes. Most of these soils are wooded, and trees grow fairly well. Summer homes are scattered throughout areas of these soils.

Representative profile of Edgemont very stony loam, 6 to 25 percent slopes, in a wooded area above State Route 9 south at overlook on Blue Ridge near Keyes Gap:

O1—1½ inches to ½ inch, loose oak leaves.

O2—½ inch to 0, black decomposed leaf mull and mineral material.

A1—0 to 2 inches, black (10YR 2/1) very stony loam; weak, fine, granular structure; loose; 15 percent stones up to 2 feet in diameter; many fine roots; strongly acid; abrupt, irregular boundary

A2—2 to 9 inches, brown (10YR 5/3) very stony loam; weak, fine and medium, subangular blocky and very weak, thin, platy structure; very friable; 20 percent stones; many roots; strongly acid; clear, wavy boundary

B21t—9 to 16 inches, yellowish-brown (10YR 5/4) very stony sandy clay loam; weak, fine and medium, subangular blocky structure, friable, 20 percent sandstone and quartzite fragments up to 18 inches in diameter, common roots; thin patchy clay films; very strongly acid; clear, wavy boundary

B22t—16 to 25 inches, yellowish-brown (10YR 5/6) very stony sandy clay loam, moderate, medium and fine subangular blocky structure, friable but firmer than B21t horizon; 20 percent sandstone and quartzite fragments up to 18 inches in diameter; common roots, thin patchy clay films and clay flows in root holes: very strongly acid; clear, wavy boundary.

B3—25 to 29 inches, yellowish-brown (10YR 5/6) and pockets of yellowish brown (10YR 5/4) very stony sandy loam, weak, medium, subangular blocky structure; firm; 35 percent sandstone and quartzite fragments up to 15 inches in diameter; few roots, very strongly acid; clear, wavy boundary.

C—29 to 50 inches +, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) very stony sandy loam; massive; firm, 60 percent sandstone and quartzite fragments up to 15 inches in diameter; very strongly acid.

The B horizon is mainly sandy clay loam but ranges to sandy loam in the B22 and B3 horizons Content of coarse fragments throughout the solum ranges from less than 15 percent to 35 percent Depth to bedrock ranges from 42 to 60 inches Reaction of soils in undisturbed areas ranges from strongly acid to very strongly acid

Edgemont soils are associated with shaly, moderately deep Berks soils; shaly, shallow Weikert soils; finer textured Laidig soils; and moderately deep Dekalb soils Edgemont soils are deeper to bedrock and have a finer textured subsoil than Dekalb soils They formed in residuum weathered from sandstone, quartzite, and siltstone, but the Laidig soils formed in colluvium from similar material Edgemont soils contain more sand than Clifton soils.

Edgemont very stony loam, 6 to 25 percent slopes (EdD).—This soil (fig. 6) has the profile described as representative for the series. It is on mountain crests, benches, and tops of short spurs along the mountain. Included in mapping were extremely stony spots and small areas of Steep rock land. Also included were shallow sandy soils near breaks to steeper slopes.

Almost all of this soil is wooded. This soil is not suited to crops or pasture because of moderately low fertility, droughtiness, and stoniness. It is better suited to trees. In many places this soil is used as a site for summer homes. Capability unit VIIs 2.

Edgemont very stony loam, 25 to 50 percent slopes (EdF).—This soil has a profile similar to that described as representative for the series, except it contains more large stones. Included in mapping were small extremely stony areas and a few escarpments. Also included were moderately steep Edgemont and Laidig soils.

Except for the few areas around summer homes, all of this soil is wooded. Steepness of slope, moderately low fertility, and stoniness severely limit the use of this soil for crops and pasture. It is better suited to trees. Capability unit VIIs–2.

Frankstown Series

The Frankstown series consists of deep, well drained soils. These soils formed in material weathered from silty limestone and interbedded limy shales. They are in a band extending northeast from the Virginia state line south of Rippon through the center of the county to the Potomac River. This area is characterized by low, rounded, parallel ridges.

Figure 6.—**Area of Edgemont very stony loam, 6 to 25 percent slopes.**

In a representative profile the surface layer is a dark grayish-brown shaly silt loam about 5 inches thick. The subsurface layer is yellowish-brown shaly silt loam about 7 inches thick. The subsoil extends to a depth of 29 inches. The upper 5 inches is yellowish-brown shaly silt loam and the lower 12 inches is a strong-brown shaly silty clay loam. Below this, to a depth of 60 inches, is strong-brown and dark-brown shaly silt loam which is underlain by siliceous limestone.

Frankstown soils are easily worked and are fertile. Permeability is moderate. Available moisture capacity is high.

These soils are suited to and used extensively for crops and pasture. They are well suited to orchards, and air drainage generally is good.

Representative profile of Frankstown shaly silt loam, 12 to 25 percent slopes, in a pasture east of Moler Crossroads 0.7 mile north of Shenandoah Junction:

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) shaly silt loam; weak, fine, granular structure; friable, many roots; 25 percent shale fragments up to 1 inch long, slightly acid; abrupt, smooth boundary.

A2—5 to 12 inches, yellowish-brown (10YR 5/4) shaly light silt loam; weak, medium, subangular blocky structure, friable; common fine roots; 30 percent shale fragments up to 2 inches long, many fine pores; slightly acid, clear, wavy boundary.

B21t—12 to 17 inches, yellowish-brown (10YR 5/6) shaly silt loam, moderate, medium, subangular blocky structure, firm; few roots; 30 percent shale fragments up to 2 inches long, many fine pores; thin patchy clay films; medium acid; clear, wavy boundary.

B22t—17 to 26 inches, strong-brown (7.5YR 5/6) shaly silty clay loam; some yellowish-red (5YR 4/6) spots and streaks; moderate, medium, subangular blocky structure, firm, few roots; 30 percent shale fragments up to 2 inches long; common fine pores; medium continuous clay films; common black manganese faces; medium acid, gradual, wavy boundary.

B23t 26 to 29 inches, strong-brown (7.5YR 5/6) shaly silty clay loam; weak, medium, subangular blocky structure; firm; few fine roots; 35 percent shale fragments up to 2 inches long; common fine pores; thin patchy clay films; very strongly acid; gradual, wavy boundary.

B&C—29 to 60 inches, strong-brown (7.5YR 5/6) and dark-brown (7.5YR 4/4) shaly silt loam, common streaks and pockets of yellowish-red (5YR 4/6) silty clay; massive; firm: 40 percent shale fragments up to 3 inches that increase in quantity with depth; thin patchy clay films: strongly acid

R—60 inches, shaly buff-colored siliceous limestone

The B horizon ranges from shaly silt loam to shaly silty clay loam, and from yellowish brown to strong brown. Coarse

fragments range from 10 to 40 percent in the B horizon The B2t horizon ranges from 8 to 18 inches in thickness Depth to bedrock is from 4 to 7 feet Natural reaction ranges from very strongly acid to medium acid

Frankstown soils have more shale fragments and a thinner subsoil than Duffield soils, and they have a less red, thinner subsoil than Benevola. Frederick, and Hagerstown soils.

Frankstown shaly silt loam, 2 to 6 percent slopes (FbB).—This gently sloping soil is in fairly large areas on slopes and in narrow strips along the crest of ridges. This soil has a profile similar to that described as representative for the series, except that it contains less coarse fragments throughout. Included in mapping were small areas of Hagerstown, Frederick, and Duffield soils. Also included were a few, small, strongly sloping soils, a few severely eroded areas, and a few limestone outcrops.

Almost all of this soil is cleared and a considerable acreage is in orchards. It is well suited to all locally grown crops. It is well suited to orchards, but frost pockets are a hazard in places. In a few areas rock outcrops influence the direction of tillage. Choosing a suitable cropping system and using contour stripcropping, sodded waterways, and minimum tillage help to control losses of soil and water. Capability unit IIe–1.

Frankstown shaly silt loam, 6 to 12 percent slopes (FbC).—This soil is on short breaks along intermittent drainageways and near the crest of low ridges. Included in mapping were small areas of Duffield soils and a few limestone outcrops. Also included were small severely eroded areas and a few gently sloping areas.

This soil is suited to all crops commonly grown in the county. Drought causes damage during prolonged dry periods. In places rock outcrops influence the direction of tillage. Choosing a suitable cropping system and using contour stripcropping, minimum tillage, sodded waterways, and returning crop and animal residue to the soil help to control losses of soil and water. Capability unit IIIe–1.

Frankstown shaly silt loam, 6 to 12 percent slopes, severely eroded (FbC3).—This soil has had most of the original surface layer removed by erosion. Except that it is less deep to bedrock, this soil has the profile described as representative for the series. Included in mapping were a few moderately eroded areas, some very shaly areas, some moderately steep areas, and a few limestone outcrops.

Nearly all of this soil is cleared. It is suited to all locally grown crops. In some areas rock outcrops influence the direction of tillage. Prolonged dry periods can cause crop damage. Choosing a suitable cropping system, and using field or contour stripcropping, sodded waterways, and diversions help to control runoff. Orchards need the protection of a permanent, close-growing vegetative cover. Capability unit IVe–1.

Frankstown shaly silt loam, 12 to 25 percent slopes (FbD).—This soil has the profile described as representative for the series. It is in small areas adjacent to drainageways and on the sides of low ridges. Included in mapping were some strongly sloping soils, a few areas of severely eroded soils, small areas of Duffield soils, and a few limestone outcrops.

Most areas are in crops or pasture. Prolonged dry periods can cause crop damage. In some areas rock outcrops influence the direction of tillage. Choosing a suitable cropping system, using stripcropping and sodded waterways, and returning crop and animal residue to the soil help control losses of soil and water. Capability unit IVe–1.

Frankstown shaly silt loam, 12 to 25 percent slopes, severely eroded (FbD3).—Most of the original surface layer of this moderately steep soil has been removed by erosion. this soil has a profile that is less deep to bedrock than that described as representative for the series. Most areas of this soil are near drainageways where runoff from higher areas concentrates. Included in mapping were small, moderately eroded areas and very rocky and very shaly spots.

Most of this soil has been in crops, but is now used mainly as pasture. Shaly and shallower areas are droughty in places. Moderately steep slopes and the hazard of further erosion limit use of these soils for crops. This soil is suited to pasture. Reseeding tall-grass pastures in alternate strips helps control excessive runoff. Capability unit VIe-1.

Frankstown shaly silt loam, 25 to 35 percent slopes, severely eroded (FbE3).—This soil is in narrow bands along the sides of steep ridges. Most of the original surface layer has been removed by erosion. This soil has a profile that is shallower than that described as representative for the series. Included in mapping were some moderately eroded areas and some limestone outcrops.

Most of this soil is in pasture but it is better suited to trees. Some areas are droughty. This soil generally is managed with the nearby, less sloping soils. Good pasture management is needed. Capability unit VIIe–1.

Frankstown very rocky silt loam, 6 to 12 percent slopes (FcC)—This soil is in narrow bands on hillsides between areas of gently sloping soils and narrow drainageways. This strongly sloping soil has a profile similar to the profile described as representative for the series, but limestone outcrops cover up to 25 percent of the surface, and depth to bedrock is more irregular. Included in mapping were gently sloping areas, very rocky Frankstown soils, and rocky and extremely rocky areas. Also included were severely eroded areas and areas that are shallower to bedrock.

Some of this soil is in woodland but most is in pasture. Machinery can be used on all but the most rocky areas. Tall-grass pasture protects this soil from erosion. Limestone ledges influence the direction of tillage. Capability unit VIs–1.

Frankstown very rocky silt loam, 12 to 25 percent slopes (FcD).—This soil is in narrow bands on the sides of ridges. It has a profile that is similar to that described as representative for the series, but limestone outcrops cover up to 25 percent of the surface, and depth to bedrock is more irregular. Included in mapping were rocky and extremely rocky spots.

Most areas are in permanent bluegrass pasture, but careful management is needed to control excessive losses of soil and water. The rockiest areas remain wooded. This soil is suited to pasture or trees. Machinery can be used on all but the most rocky areas. Tall grass pasture adequately protects this soil from erosion. Limestone ledges influence the direction of tillage. Capability unit VIs–1.

Frankstown very rocky silt loam, 12 to 25 percent slopes, severely eroded (FcD3).—Most areas of this soil are on breaks along drainageways. The original surface layer has been removed by erosion in most areas. Com-

monly this soil is moderately deep to limestone or shale. Included in mapping were a few, small, rocky and extremely rocky spots. Also included were a few steep areas.

Rockiness, moderately steep slopes, and the severe hazard of erosion severely limit use for cultivated crops or pasture. This soil is well suited to woodland. Capability unit VIIs-1.

Frederick Series

The Frederick series consists of deep, well-drained soils in the Great Limestone Valley. Slopes are short and irregular. These soils formed in material weathered from limestone, that contained some quartz grains and angular chert. Frederick soils in Jefferson County are mapped only in undifferentiated units with Hagerstown soils.

In a representative profile the surface layer is dark-brown cherty silt loam about 9 inches thick. The subsurface layer is yellowish-brown silt loam about 3 inches thick. The subsoil extends to a depth of 55 inches. The upper 7 inches is a strong-brown silty clay loam; the middle 25 inches is slightly plastic and slightly sticky, red silty clay; and the lower 11 inches is red cherty clay.

Frederick soils are easy to work, except where they are eroded or very rocky. Permeability is moderate. Available moisture capacity and natural fertility are high.

These soils are suited to corn, small grain, alfalfa, and orchard fruits. Many of the very rocky areas are suited to pasture.

Representative profile of Frederick cherty silt loam from an area of Hagerstown and Frederick cherty silt loams, 2 to 6 percent slopes, 100 yards north of State Route 51, 3½ miles west of Charles Town:

Ap—0 to 9 inches, dark-brown (10YR 4/3) cherty silt loam; weak, fine, subangular blocky and weak, fine, granular structure; very friable; many roots; 20 percent chert fragments; slightly acid; abrupt, smooth boundary.

A2—9 to 12 inches, yellowish-brown (10YR 5/4) silt loam; very weak, medium, platy and weak, fine and medium, subangular blocky structure; friable; common roots; 10 percent chert fragments; slightly acid; clear, wavy boundary

B21t—12 to 19 inches, strong-brown (7.5YR 5/6) silty clay loam, with a few streaks of yellowish red (5YR 5/6); moderate, medium, blocky structure; friable to firm; thin patchy clay films; 10 percent chert fragments; strongly acid; clear, wavy boundary.

B22t—19 to 33 inches, red (2.5YR 5/6) silty clay; strong, fine, blocky structure; firm, slightly plastic and slightly sticky; thick, continuous, strong-brown (7.5YR 5/6) clay films; 10 percent chert fragments; few, fine, yellowish-brown (10YR 5/6) siltstone particles up to ¼ inch across, strongly acid; clear, wavy boundary

B23t—33 to 44 inches, red (2.5YR 5/8) silty clay; strong, fine and medium, blocky structure, firm, slightly plastic and slightly sticky; thick, continuous, strong-brown (7.5YR 5/6) clay films and a few faces of yellowish brown (10YR 5/6); 10 percent chert fragments; few, fine, yellowish-brown (10YR 5/6) siltstones up to ¼ inch across; strongly acid; clear, wavy boundary.

B3—44 to 55 inches, red (2.5YR 5/8) cherty clay; few patches of yellowish-brown (10YR 5/6); weak to moderate, fine and medium, subangular blocky structure; firm; thin patchy clay films; 20 percent chert fragments; strongly acid.

The surface layer ranges from cherty silt loam to cherty silty clay loam. The B horizon is silty clay or clay and ranges from red to yellowish-red; however, the upper few inches of the B horizon ranges to strong brown. Coarse fragments range from less than 10 percent to about 30 percent. Bedrock is at a depth of from 4 to 10 feet. Reaction is strongly acid to medium acid.

The argillic horizons of these soils are slightly thinner than the defined range for the series, but this difference does not alter their use or behavior.

Frederick soils are associated with browner and less acid Hagerstown and Benevola soils; with less red, less clayey Duffield soils; and with Frankstown soils that have a thinner solum and contain more shale. Frederick soils have less sandy clay than Braddock soils and are deeper than the Chilhowie and Opequon soils

Hagerstown Series

The Hagerstown series consists of deep, well-drained soils in the Great Limestone Valley. Slopes are short and irregular. These soils formed in material derived from limestone.

In a representative profile the surface layer is dark-brown silt loam about 7 inches thick. The subsoil extends to a depth of 62 inches. The upper 36 inches is yellowish-red silty clay or clay, and is mostly plastic and sticky. The lower 19 inches is variegated, dark-red, yellowish-red, and strong brown silty clay.

Hagerstown soils are easy to work and are fertile. Permeability is moderate. Available moisture capacity is high.

These soils are suited to corn, small grains, alfalfa, and to orchard fruits. About half of the acreage is very rocky and suited only to pasture and trees.

Representative profile of Hagerstown silt loam, 2 to 6 percent slopes, south of State Route 51, 1¾ miles west of Charles Town:

Ap—0 to 7 inches, dark-brown (7.5YR 4/2) silt loam; moderate, medium and fine, granular structure; friable; many roots; few chert fragments; slightly acid; abrupt, smooth boundary.

B21t—7 to 12 inches, yellowish-red (5YR 5/6) silty clay; moderate, medium and fine, blocky structure, firm, slightly plastic and slightly sticky; medium patchy clay films; common roots; some material from Ap horizon in root channels, slightly acid; clear, wavy boundary

B22t—12 to 32 inches, yellowish-red (5YR 4/6) clay; strong, fine and medium, blocky structure; firm, plastic, and sticky; few roots; thick continuous clay films; medium acid; gradual, wavy boundary.

B23t—32 to 38 inches, yellowish-red (5YR 4/6) silty clay; strong-brown (7.5YR 5/6) streaks; moderate to strong, fine and medium, blocky structure; firm, plastic and sticky; few roots; medium continuous clay films; slightly acid; gradual, wavy boundary.

B24t—38 to 43 inches, yellowish-red (5YR 4/6) silty clay; common, strong-brown (7.5YR 5/6) streaks; moderate, fine and medium, blocky structure; firm, plastic and slightly sticky; few roots; medium continuous clay films, slightly acid, gradual, wavy boundary.

B3—43 to 62 inches, variegated dark-red (2.5YR 3/6), yellowish-red (5YR 4/6), and strong-brown (7.5YR 5/6) silty clay; weak, medium, platy structure; firm, plastic and sticky; thin discontinuous clay films; some very soft yellowish-brown (10YR 5/6) siltstone; slightly acid

The B horizons are clay and silty clay and range from yellowish red to dark reddish brown (fig. 7) Depth to bedrock ranges from 4 to 10 feet. Natural reaction ranges from medium acid to slightly acid

Hagerstown soils are associated with the Frederick soils that are less brown and more acid in the subsoil. They are redder and finer textured than the adjoining Duffield and

Figure 7.—Profile of a Hagerstown silt loam.

Frankstown soils Hagerstown soils have a coarser, less red surface layer and a lighter colored subsoil than the limestone-influenced Benevola soils They are deeper than the Opequon, Chilhowie, and Weikert soils. Hagerstown soils are finer textured than Braddock soils.

Hagerstown silt loam, 2 to 6 percent slopes (HbB).—This soil has the profile described as representative for the series. It is commonly in large undulating areas. Slopes are short and fairly smooth. Included in mapping were a few strongly sloping areas that surround shallow depressions and a few areas of limestone outcrops. Also included were spots that have a few scattered chert fragments on the surface and some nearly level areas.

This soil is suited to all crops commonly grown in the county. It is well suited to orchards, but frost pockets are a hazard in places. In some areas a few ledges of limestone influence the direction of tillage. Stripcropping and using sodded waterways help to retard runoff and erosion. Capability unit IIe 1.

Hagerstown silt loam, 6 to 12 percent slopes (HbC).—This soil has a profile similar to the one described as representative for the Hagerstown series, but slopes are short, complex, and are often dissected by numerous intermittent drainageways. Included in mapping were small severely eroded areas and a few areas of moderately steep soils that surround the drainageways. Also included were small, cherty areas; some narrow strips of Huntington, local alluvium; some Frederick soils; a few areas near the breaks of the slopes that are not as deep to limestone; and a few areas of limestone outcrops.

This soil is suited to all crops commonly grown in the county and to orchard fruits. In some areas a few limestone ledges influence the direction of tillage. Air drainage is better, and there is less danger from frost than on the gently sloping soil. A suitable cropping system using minimum tillage and sodded waterways helps to prevent erosion on the strongly sloping soils. Capability unit IIIe–1.

Hagerstown extremely rocky silt loam, 5 to 25 percent slopes (HcC).—The profile of this soil is redder and more sticky than that described as representative for the series, and depth to bedrock is shallower and more irregular. Rock outcrops and loose limestone cover from one-fourth to one-half of the surface (fig. 8). The rocks commonly are in lines, but some are in irregularly spaced groups. This soil is scattered throughout the limestone sections of the county. Included in mapping were small very rocky areas and some areas in which the outcrops cover nearly all the surface.

This soil is suited to trees and most areas are maintained as farm woodlots. Some of the least rocky areas are suited to pasture, using native grasses. Limestone outcrops and boulders make the use of machinery impractical. Capability unit VIIs–4.

Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded (HeC3).—This soil has lost most of the original surface layer by erosion, and the heavier subsoil material and the topsoil have been mixed by plowing. The resulting surface layer is finer textured and redder than that described as representative for the series. Also, this soil is shallower to bedrock. Small areas of this soil are intermingled with the other Hagerstown soils, but many areas are on the points and the sides of the drainageways. Included in mapping were some gently sloping,

Figure 8.—**Outcropping of rocks on Hagerstown extremely rocky silt loam.**

moderately steep, and moderately eroded areas. Also included were a few limestone outcrops.

The silty clay loam surface layer, which resulted from erosion, has made this soil difficult to till, but this soil is suited to corn if a good cropping system is used. In some areas limestone outcrops influence the direction of tillage. Sodded waterways, stripcropping, minimum tillage, and winter cover crops help prevent further erosion. Capability unit IVe-1.

Hagerstown and Frederick cherty silt loams, 2 to 6 percent slopes (HfB).—The Frederick soil in this unit has the profile described as representative for the Frederick series. Hagerstown soils are similar to Frederick soils, and they have similar requirements for use and management. Soils in this unit are either all Hagerstown, all Frederick, or both. These soils are commonly in large undulating areas. Slopes are short and fairly smooth. The surface layer contains 15 to 20 percent chert fragments. Included in mapping were small, severely eroded areas, a few strongly sloping areas, some nearly level areas, and a few areas of limestone outcrops. Also included were small areas of Duffield soils.

This unit is well suited to corn, small grains, and alfalfa. It is suited to orchards, but frost pockets can be a hazard in depressions. In some areas a few hedges of limestone influence the direction of tillage. Use of a suitable cropping system, stripcropping, and sodded waterways helps to reduce runoff. Capability unit IIe-1.

Hagerstown and Frederick cherty silt loams, 6 to 12 percent slopes (HfC).—The soils in this unit are similar, and they have similar requirements for use and management. Areas are all Hagerstown soils, all Frederick soils, or both soils. These soils are in large rolling areas that are dissected by numerous drainageways. The surface layer contains about 15 percent chert fragments. Included in mapping were a few gently sloping soils, moderately steep soils, some severely eroded areas, and a few limestone outcrops. Also included were small areas of Duffield and Huntington, local alluvium soils.

This unit is suited to corn, small grains, and alfalfa. This unit is well suited to orchards. In some areas limestone outcrops influence the direction of tillage. Air drainage generally is better than on the gently sloping soils. Maintaining drainageways in sod, returning crop residue to the soil, stripcropping, and using minimum tillage help to prevent losses of soil and water. Capability unit IIIe-1.

Hagerstown and Frederick very rocky silt loams, 2 to 6 percent slopes (HgB).—The soils in this unit have profiles similar to those described as representative for their

respective series, but limestone outcrops are on one-tenth to one fourth of the surface. These soils are similar and they have similar requirements for use and management. Areas are all Hagerstown soils, all Frederick soils, or both soils. These soils are in smaller areas than Hagerstown and Frederick soils that are not rocky. The ledges generally are parallel and oriented northeast to southwest. They appear as narrow ribs, 1 to 3 feet across and a few inches to 2 feet high. Soil near the ledges tends to be somewhat redder and more clayey. Included in mapping were small rocky areas and some extremely rocky spots near Shepherdstown. Also included were a few areas that are not so clayey.

Much of this soil has been cleared and is used as pasture. The less rocky areas are in crops or are used for orchards. This soil is well suited to pasture. The parallel ledges permit the use of reseeding and mowing equipment. Tall-grass pasture affords adequate protection from erosion. The ledges commonly influence the direction of equipment travel. Capability unit VIs–1.

Hagerstown and Frederick very rocky silt loams, 6 to 12 percent slopes (HgC).—Each of the soils has a profile similar to that described as representative for its respective series, but limestone outcrops are on one-tenth to one-fourth of the surface area. Areas are all Hagerstown soils, all Frederick soils, or both soils. These soils are similar and they have similar requirements for use and management. These soils are in narrow bands around hillsides or on fairly large rolling areas. The outcropping ledges are commonly in a line, but some are in irregularly spaced groups. The ledges are oriented northeast to southwest. They appear as narrow ribs, 1 to 3 feet across and a few inches high. Soil near the ledges is redder and more clayey than other areas. Included in mapping were very narrow, moderately steep breaks and small, gently sloping, narrow flats. Also included were small extremely rocky spots.

Many areas of this unit are cleared and used as pasture (fig. 9). Some of the less rocky areas extend into crop fields and orchards. This soil is better suited to pasture or woodland than to crops because of the rockiness. Most of these soils can be mowed and reseeded with machinery. Capability unit VIs–1.

Hagerstown and Frederick very rocky silt loams, 12 to 25 percent slopes (HgD).—The soils in this unit are similar to those described as representative for their respective series, but about one-fourth of the surface is covered with outcrops of limestone ledges. Areas are all Hagerstown soils, all Freedrick soils, or both soils. These soils are similar, and rocks cause similar use and management concerns. These soils generally are on short breaks

Figure 9.—Yellow-poplar and white oak on Hagerstown and Frederick very rocky silt loams, 6 to 12 percent slopes.

near intermittent drainageways and in narrow bands along hillsides. Included in mapping were small, rocky, extremely rocky, and steep areas. Soils near the rock outcrops are redder and more clayey than in other areas, and a few areas are severely eroded.

Most areas of this unit are in trees or pasture. They are suited to pasture, but slope and rockiness make pasture management difficult. Capability unit VIs-1.

Hagerstown and Frederick cherty silty clay loams, 6 to 12 percent slopes, severely eroded (HhC3).—These soils have profiles similar to those described as representative for their respective series, but most of the original surface layer has been removed by erosion. The present surface layer is finer textured, redder, and contains about 20 percent chert fragments. These soils are similar; they have similar requirements for proper use and management. They are scattered in association with the other Hagerstown soils, but many areas are on the points and sides of drainageways. Included in mapping were moderately steep and moderately eroded areas. Also included were small areas of Duffield, Huntington, local alluvial soils, and a few limestone outcrops.

Erosion has made tillage difficult, but this soil is suited to all locally grown crops. It is suited to row crops if grown in a cropping system with long-term hay. In some areas rock outcrops influence the direction of tillage. Intensive conservation practices are needed to help reduce runoff and control further excessive erosion. Capability unit IVe-1.

Hagerstown and Frederick very rocky silty clay loams, 6 to 12 percent slopes, severely eroded (HlC3).—These soils differ from those described as representative for their respective series by having outcropping limestone ledges and by having most of their original surface layer removed by erosion. The present surface layer is redder, more clayey, and does not take in water as readily as the original surface layer. These soils are similar and have similar requirements for use and management. Areas are Hagerstown soils, Frederick soils, or both. Limestone ledges are on about one-fifth of the surface. These soils are scattered in association with the other Hagerstown and Frederick soils, but many areas are on points and sides of drainageways where runoff has concentrated. Included in mapping were small moderately eroded areas and a few extremely rocky areas.

Much of the acreage of this unit is in crops, but soil losses and rock outcrops make cultivation impractical. Some areas extend into orchards and crop fields. These soils are better suited to pasture or trees than to crops. Proper management of tall-grass pasture is difficult in some areas, but bluegrass and white clover are suited. Capability unit VIs-1.

Hagerstown and Frederick very rocky silty clay loams, 12 to 25 percent slopes, severely eroded (HlD3).—The soils in this unit are similar to those described for their respective series, but limestone outcrops occupy about one-fifth of the surface and erosion has removed most of the original surface layer. The present surface layer is redder than the surface layer of the soil described as representative and does not absorb water readily. These soils are similar; they have similar requirements for use and management. These soils are generally on short breaks near small drainageways or in bands along the hills where water or livestock have cut through the sod and runoff has removed much of the surface layer. Included in mapping were some moderately eroded spots and a few extremely rocky areas.

Many areas of this unit are small and are managed with the surrounding soils. Most of these soils are in pasture, but they are difficult to manage properly because of rockiness and the severe erosion hazard. They are better suited to trees. Capability unit VIIs-1.

Huntington Series

The Huntington series consists of deep, nearly level, well-drained soils on flood plains of streams and along intermittent drainageways in the Limestone Valley. These soils formed in recent alluvium washed from limestone uplands. They are subject to flooding.

In a representative profile the surface layer is dark-brown silt loam about 10 inches thick. The subsoil extends to a depth of 42 inches. The upper 11 inches is dark-brown silt loam, and the lower 21 inches is dark yellowish-brown silt loam that contains chert and sandstone fragments. The substratum is strong-brown and yellowish-red silty clay loam and silt loam.

Huntington soils are easily worked, and they are fertile. Permeability is moderate. Available moisture capacity is high.

These soils are suited to corn, small grains, and alfalfa. Flooding and ponding occur during prolonged wet periods. Frost pockets severely limit use for orchards.

Representative profile of Huntington silt loam, local alluvium in pasture, one-half miles northwest of Shepherd College in Shepherdstown:

Ap—0 to 10 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; friable; many roots; few, angular, sandstone and chert fragments; few pores; neutral; abrupt, smooth boundary.

B1—10 to 21 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; fine roots; common quartz grains; neutral; gradual, wavy boundary

B2—21 to 42 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, subangular blocky structure; firm; few roots; 15 percent chert and sandstone fragments less than 2 inches in diameter; common iron concretions, decreasing with depth; neutral; gradual, wavy boundary

IIC—42 to 52 inches, strong-brown (7.5YR 5/6) silty clay loam and silt loam mixed with some yellowish-red (5YR 4/6 to 5/6) heavy silty clay loam; massive; firm; few manganese concretions; slightly acid.

The A horizon ranges from very dark grayish brown to dark brown. The B horizon ranges from dark brown to dark yellowish brown. Depth to residual material or stratified alluvium ranges from 40 to 80 inches. Natural reaction ranges from slightly acid to neutral. The hazard of flooding ranges from slight to moderate

Huntington soils are associated with the moderately well drained Lindside and poorly drained Melvin soils. They contain less sand throughout than Landes soils that are along rivers Huntington soils are slightly lower than Ashton soils, and they are flooded more frequently than the Ashton soils. Huntington soils are at lower elevations than Monongahela soils, and they lack the fragipan that is present in Monongahela soils.

Huntington silt loam (Hn).—This nearly level soil has a profile similar to that described as representative for the series, but the substratum consists of stratified sand and silt. It is along Opequon Creek and other permanent

streams. Included in mapping were a few areas of Lindside, Melvin, and Ashton soils.

This soil is subject to streambank cutting and scouring during periods of high water. The hazard of flooding is moderate. Most of the acreage of this soil is in crops or pasture. The soil is suited to all locally grown crops except orchard fruits. Row crops can be grown continuously but winter cover crops are needed to protect this soil from erosion and to help maintain tilth. Capability unit IIw-6.

Huntington silt loam, local alluvium (Ho).—This soil has the profile described as representative for the series. It is in narrow strips along intermittent drainageways. A few small chert and sandstone fragments are throughout the profile. Included in mapping were a few areas of Lindside soils, local alluvium, and a few areas of Alluvial land, marl substratum.

Short-term ponding occurs in some areas. This soil is suited to corn, small grains, and alfalfa. Use of this soil for orchards is severely limited because of frost pockets. This soil is in narrow strips and is generally managed along with surrounding soils. It can be farmed intensively, but winter cover crops help prevent erosion and maintain tilth. Capability unit I-6.

Laidig Series

The Laidig series consists of deep, well-drained, strongly sloping and moderately steep, gravelly or very stony soils on foot slopes. These soils formed in deep colluvium from quartzite, sandstone, and siltstone that accumulated at the base of Blue Ridge.

In a representative profile the surface layer is very dark grayish-brown very stony loam about 3 inches thick. The subsurface layer is yellowish-brown fine sandy loam about 8 inches thick. The subsoil is about 25 inches thick and extends to a depth of 36 inches. It is strong-brown sandy clay loam that contains sandstone fragments throughout. The substratum or fragipan is a dense, brittle, very firm layer below a depth of 36 inches.

Available moisture capacity is high, and natural fertility is moderate in these soils. Permeability is moderate in the subsoil and moderately slow in the fragipan.

These soils are mostly wooded, but areas that are not stony are suited to row crops. The stony areas are suited to pasture. Some areas are used as building sites.

Representative profile of Laidig very stony loam, 6 to 12 percent slopes, in a wooded area near intersection of Moonshine and White Mule Lanes in Shannondale:

O1—1½ inches to ½ inch, loose hardwood leaves

O2—½ inch to 0, black mull.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) very stony loam; moderate, fine, granular structure; loose; many roots, 20 percent partly rounded sandstone fragments that have a maximum diameter of 12 inches; strongly acid; clear, smooth boundary.

A2—3 to 11 inches, yellowish-brown (10YR 5/4) fine sandy loam, weak, fine, subangular blocky structure and very weak, thin, platy structure; very friable; many fine roots; 30 percent sandstone fragments that have a maximum diameter of 10 inches; strongly acid, clear, wavy boundary.

B1—11 to 16 inches, strong-brown (7.5YR 5/6) light sandy clay loam; brown (7.5YR 5/4) ped surfaces; weak, medium and fine, subangular blocky structure; friable, common roots; 30 percent partly rounded sandstone fragments that have a maximum diameter of 8 inches; strongly acid; clear, wavy boundary.

B21t—16 to 29 inches, strong-brown (7.5YR 5/6) sandy clay loam; moderate, medium and fine, subangular blocky structure; friable; few roots; 30 percent partly rounded sandstone fragments that have a maximum diameter of 5 inches; thin, patchy clay films; strongly acid; clear, wavy boundary

B22t—29 to 36 inches, strong-brown (7.5YR 5/6) sandy clay loam; weak to moderate, medium, subangular blocky structure; firm; few roots; 30 percent partly rounded sandstone fragments that have a maximum diameter of 8 inches; thin, patchy clay films; strongly acid; gradual, wavy boundary.

Cx—36 to 50 inches, variegated, yellowish-red (5YR 4/6), yellowish brown (10YR 5/4), and strong-brown (7.5YR 5/6) sandy loam; massive; very firm; 65 percent partly rounded sandstone fragments that have a maximum diameter of 8 inches; few silt coatings or clay films; strongly acid.

The B horizon ranges from clay loam to sandy clay loam and from yellowish red to yellowish brown. Coarse fragments range from 15 to 35 percent in the solum Depth to the fragipan ranges from 30 to 45 inches, and depth to bedrock ranges from 6 to 20 feet. Natural reaction is strongly acid or very strongly acid

Laidig soils are below the shallower Dekalb and Edgemont soils that have a coarser subsoil and lack a fragipan The Laidig soils are deeper and contain less silt than Berks and Weikert soils Laidig soils contain more sand than Clifton soils.

Laidig gravelly loam, 6 to 12 percent slopes (LaC).—This strongly sloping soil is gravelly, but the profile otherwise is similar to that described as representative for the series. It is commonly farther from the mountains than the more stony soils. Included in mapping were some gently sloping areas and a few stony areas.

Most of this soil is wooded, but the soil is suited to all locally grown crops. Diversion ditches are needed in places to control runoff from upslope areas. If this soil is cultivated, natural drainageways need to be maintained in sod. Cropping systems and contour stripcropping help to prevent excessive erosion. Capability unit IIIe-4.

Laidig gravelly loam, 12 to 25 percent slopes (LaD).—This soil contains fewer large stones, but the profile otherwise is similar to that described as representative for the series. In most places this soil is not close to the mountains. Included in mapping were a few stony areas along intermittent streams and a few areas of steep, gravelly Laidig soils.

Nearly all of this soil is wooded. If it is used for crops, diversion ditches, a suitable cropping system, and other fairly intensive conservation practices help to control runoff. Capability unit IVe-3.

Laidig very stony loam, 6 to 12 percent slopes (LbC).—This soil has the profile described as representative for the series. It is along foot slopes of the mountains, and it formed in colluvium underlain by shale. During wet periods springs are common in many draws. Included in mapping were extremely stony spots and areas where the soil is gently sloping.

Nearly all of this soil is wooded. Several summer homes have been built on this soil. It is suitable for pasture or trees. Tree growth is good, but the extremely stony spots impose some limitations on use of equipment for harvesting. Capability unit VIs-2.

Laidig very stony loam, 12 to 25 percent slopes (LbD).—This moderately steep soil is below steep mountain slopes.

Included in mapping were some extremely stony areas in drainageways. Also included were a few steep spots and some small areas of Edgemont soils.

All of this soil is wooded and is well suited to this use. The soil is suited to pasture, but stones and slopes make management fairly difficult. Capability unit VIs 2.

Landes Series

The Landes series consists of deep, nearly level, well-drained soils. They formed in recent alluvium washed from limestone uplands. They are on flooded bottom lands along the Shenandoah and Potomac Rivers. These soils are subject to flooding.

In a representative profile the surface layer is dark-brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of 40 inches and is dark-brown fine sandy loam. The substratum is stratified silt loam and fine sandy loam.

Landes soils are easily worked and are fertile. Permeability is moderately rapid. Available moisture capacity is high.

These soils are suited to corn, alfalfa, and other locally grown crops. No commercial orchards are on these soils.

Representative profile of Landes fine sandy loam in a cultivated area east of Kabletown, west of the Shenandoah River, and south of Bullskin Run:

Ap—0 to 10 inches, dark-brown (10YR 3/3) heavy fine sandy loam; weak, fine, granular structure; very friable, many roots; mildly alkaline, abrupt, smooth boundary.

B2—10 to 22 inches, dark-brown (10YR 4/3) heavy fine sandy loam; weak, fine, granular and very weak, fine, subangular blocky structure; very friable; common fine roots; mildly alkaline; clear, smooth boundary

B3—22 to 40 inches, dark-brown (7.5YR 4/2) fine sandy loam; very weak, fine, subangular blocky structure; very friable; few roots; mildly alkaline; clear, wavy boundary

C—40 to 70 inches. dark-brown (10YR 4/3) stratified silt loam and fine sandy loam; massive; very friable; mildly alkaline.

The B horizon ranges from dark brown to brown. Natural reaction is slightly acid to mildly alkaline. Soils along the Shenandoah River effervesce when treated with dilute hydrochloric acid

Landes soils are associated with well-drained and less alkaline Huntington soils, moderately well drained Lindside soils, and poorly drained Melvin soils. Landes soils are slightly lower than Ashton soils, and they are flooded more frequently than Ashton soils Landes soils contain more sand than Huntington soils.

Landes fine sandy loam (Lf).—This is the only Landes soil mapped in the county. This soil is nearly level. Included in mapping were narrow strips of Lindside and Melvin soils and a few areas where the soil is more sandy than this soil. Also included were steeper soils along banks of rivers.

Most of this soil is used for crops. but some areas are in pasture. This soil is suited to all locally grown crops, but not to orchards. Row crops can be grown continuously, but winter cover crops are needed to protect the soil. The hazard of flooding is moderate. Unprotected low-lying areas are subject to stream scouring in winter. Capability unit IIw–6.

Lindside Series

The Lindside series consists of deep, nearly level, moderately well drained soils. These soils formed in alluvium washed from limestone uplands. They are on flood plains of rivers and streams and in poorly defined drainageways and broad flats.

In a representative profile the surface layer is dark grayish-brown silt loam about 10 inches thick. The subsoil extends to a depth of 36 inches. The upper 6 inches is brown silt loam, and the middle 7 inches is brown silt loam that has grayish-brown and strong-brown mottles. The lower 13 inches is mottled, grayish-brown silty clay loam. The substratum is variegated gray and yellowish-brown gravelly silty clay loam.

The Lindside soils are fertile, but in places wetness delays tillage in spring. Permeability is moderately slow or moderate. Available moisture capacity is high.

Lindside soils are suited to corn, but in places winter grains are damaged by the seasonally high water table. Also, alfalfa and orchards are damaged by seasonally high water tables.

Representative profile of Lindside silt loam, local alluvium, 2 miles west of Charles Town along Summit Point Pike:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular and moderate, fine, subangular blocky structure; very friable; brown organic stains along cracks and root channels; 5 percent quartzite fragments less than 2 inches in diameter; neutral; clear, wavy boundary

B1—10 to 16 inches, brown (10YR 4/3) silt loam; weak, fine, granular and weak, fine, subangular blocky structure; friable; common brown (7.5YR 4/4) ped faces; common worm casts; less than 5 percent stone fragments less than 2 inches in diameter; slightly acid; clear, wavy boundary

B21—16 to 23 inches, brown (10YR 5/3) heavy silt loam; common, fine and medium, grayish-brown (2.5Y 5/2) and strong-brown (7.5YR 5/6) mottles; weak to moderate, fine, subangular blocky structure; friable to firm; 0 to 5 percent chert, shale, and sandstone fragments less than 2 inches in diameter; slightly acid; clear, wavy boundary.

B22g—23 to 36 inches. grayish-brown (2.5Y 5/2) light silty clay loam; common, medium and coarse. strong-brown (7.5YR 5/6) mottles, weak to moderate. medium. subangular blocky structure, friable to firm; few, fine, manganese concretions; 5 percent chert, shale, and sandstone fragments less than 2 inches

IIC—36 to 45 inches, variegated, gray (N 5/0) and yellowish-brown (10YR 5/6) gravelly silty clay loam; some streaks of clay loam and silty clay; massive; firm; 30 to 40 percent chert, shale, and quartz fragments; common manganese concretions; medium acid.

The B horizon ranges from silt loam to silty clay loam. Depth to mottles ranges from 11 to 24 inches Content of coarse fragments in the solum ranges from 0 to 10 percent. Reaction ranges from medium acid to slightly acid.

Lindside soils are associated with the well-drained Huntington, Landes, and Ashton soils with the poorly drained Melvin soils Along the smaller streams Lindside soils are associated with Alluvial land. marl substratum Above Lindside soils are Monongahela soils that have a fragipan.

Lindside silt loam (Ln).—This nearly level soil is along the Potomac River, Opequon Creek, and smaller permanent streams. It contains less chert and sandstone fragments than the soil described as representative for the series. Included in mapping were small areas of Huntington and Melvin soils.

The hazard of flooding is moderate, and scouring occurs in some areas. Most of this soil has been cleared. It is suited to corn or pasture. Wetness often limits tillage and grazing early in spring. The seasonally high water table limits suitability for alfalfa and winter grains. Drainage improves this soil, but suitable outlets are difficult to locate in some areas because of the high level of the streams. Capability unit IIw-7.

Lindside silt loam, local alluvium (Lo).—This nearly level soil has the profile described as representative for the series. It is scattered throughout the limestone parts of the county in poorly defined intermittent drainageways and on broad flats. It receives runoff and soil material from the surrounding uplands. Included in mapping were areas that have a few limestone outcrops. Also included were a few well-drained and somewhat poorly drained areas. The hazard of flooding is slight to moderate, but in places lower areas remain ponded after heavy rain or flooding. Most areas of this soil are suited to corn or pasture. Wetness often limits tillage and grazing early in spring. These soils are easily compacted if worked or grazed when wet. Ditches are needed in places to divert runoff from higher slopes. A few suitable outlets for tile drains are available. Capability unit IIw-7.

Marl Pit

Marl pit (Ma) is a land type along small streams throughout the limestone parts of the county. The surface layer has been removed, and the exposed marl is excavated and then processed into lime for farm use. The pits range from about 3 to 10 feet in depth.

The remaining marl is strongly alkaline, and very little vegetation grows on it. In places streams flow into abandoned pits and form fairly large ponds. Capability unit not assigned.

Melvin Series

The Melvin series consists of deep, nearly level, poorly drained soils. These soils formed in alluvium on bottom lands that are subject to flooding. They are on flood plains of rivers and along streams in the limestone parts of the county.

In a representative profile the surface layer is about 9 inches of grayish-brown silt loam that has brown mottles. The subsoil extends to a depth of about 33 inches. The upper 7 inches is grayish-brown silt loam that has strong-brown mottles, and the lower 17 inches is a dark-gray light silty clay loam that has brown mottles. The substratum is a dark-gray heavy silt loam.

Melvin soils are fertile, but wetness limits cultivation at times. Permeability is moderately slow. Available moisture capacity is high.

Melvin soils are suited to pasture and hay. They are suited to corn, but wetness delays seedbed preparation. Undrained areas are better suited to water-tolerant grasses and legumes than to other crops.

Representative profile of Melvin silt loam, about 1 mile east of Charles Town along Cattail Run:

Apg—0 to 9 inches, grayish-brown (2.5Y 5/2) silt loam; many, fine, brown (7.5YR 4/4) mottles; weak, fine, subangular blocky structures, friable; many roots; many krotovinas, neutral, clear, wavy boundary.

B1g—9 to 16 inches, grayish-brown (2.5Y 5/2) silt loam; common, medium, strong-brown (7.5YR 5/6) mottles; weak to moderate, medium and coarse, subangular blocky structure, friable; few roots, few, fine, manganese concretions, neutral, wavy boundary.

B2g—16 to 33 inches, dark-gray (5Y 4/1) light silty clay loam; few, medium, brown (7.5YR 4/4) mottles; weak to moderate, coarse, subangular blocky structure; firm, slightly plastic; few, fine, manganese concretions; few strong-brown (7.5YR 5/6) stains in root holes; few roots; neutral; gradual, wavy boundary.

C—33 to 48 inches, dark-gray (10YR 4/1) heavy silt loam; massive; firm, plastic and nonsticky; few root channels that have a brown (7.5YR 4/4) lining, 5 to 10 percent quartz and sandstone gravel, increasing with depth, neutral.

The B horizon ranges from silt loam to light silty clay loam and from gray to brown. Natural reaction ranges from slightly acid to mildly alkaline.

Melvin soils are associated with the well drained Huntington and Landes soils and the moderately well drained to somewhat poorly drained Lindside soils. Melvin soils often are along the smaller streams associated with Alluvial land, marl substratum. Melvin soils are in lower areas than Monongahela soils, and they lack the fragipan that is present in those soils.

Melvin silt loam (Me).—This nearly level soil is the only Melvin soil mapped in the county. Included in mapping were some small, moderately well drained areas and a few very poorly drained areas. The water table is at or near the surface, and flooding is occasional to frequent.

Most areas of this soil are in pasture. A few small areas are farmed along with surrounding soils. If this soil is drained, it is suited to water-tolerant grasses and legumes. It is also suited to corn and other row crops. Wetness delays tillage and grazing in spring. This soil needs to be worked or grazed when dry because it compacts easily when wet. Capability unit IIIw-1.

Monongahela Series

The Monongahela series consists of deep, gently sloping, moderately well drained soils that have a fragipan in the lower part of the subsoil. These soils formed in stream-terrace material washed from acid sandstone and shale uplands. They are in areas above the overflow level along Opequon Creek.

In a representative profile the surface layer is dark grayish-brown light silt loam about 7 inches thick. The subsurface layer is yellowish-brown light silt loam about 2 inches thick. The subsoil extends to a depth of 38 inches. The upper 11 inches is strong-brown silt loam, and the middle 6 inches is strong-brown silty clay loam that has yellowish-red and pale-brown mottles. The lower 12 inches is a fragipan of yellowish-red very shaly silty clay loam. The substratum is yellowish-red silty clay loam.

Monongahela soils are easily worked, but their natural fertility is only moderate. Permeability is moderately slow or slow in the fragipan. Available moisture capacity is high.

These soils are suited to corn and small grains. A seasonally high water table limits use for alfalfa and orchard fruits.

Representative profile of Monongahela silt loam, 2 to

6 percent slopes, 100 yards east of Opequon Creek and north of State Route 1/11:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) light silt loam; weak, fine, granular structure; friable; common fine roots; 10 percent shale chips less than 1 inch wide; very few fine pores; medium acid; abrupt, smooth boundary.

A2—7 to 9 inches, yellowish-brown (10YR 5/4) light silt loam; very weak, thin, platy structure; friable; 10 percent shale chips less than 1 inch wide; numerous fine roots; very few fine pores; medium acid; clear, wavy boundary.

B1—9 to 13 inches, strong-brown (7.5YR 5/6) silt loam; weak to moderate, medium, subangular blocky structure; firm; few roots; few fine pores; 10 percent shale chips less than 1 inch wide; some material from Ap horizon in worm and root holes; strongly acid; gradual, wavy boundary.

B21t—13 to 20 inches, strong-brown (7.5YR 5/6) heavy silt loam; moderate, medium, subangular blocky structure; firm; few roots; very few pores; 10 percent shale chips less than 1 inch wide, thin, continuous, brown (7.5YR 5/4) clay films; strongly acid; clear, wavy boundary.

B22t—20 to 26 inches, strong-brown (7.5YR 5/6) silty clay loam; few, medium, distinct, pale-brown (10YR 6/3) mottles and coarse, distinct, yellowish-red (5YR 4/6) mottles; moderate to strong, medium, subangular blocky structure; firm; very few roots; very few pores; 15 percent shale chips less than 1 inch wide; thin, continuous, brown (7.5YR 5/4) clay films; strongly acid, abrupt, wavy boundary.

Bx—26 to 38 inches, yellowish-red (5YR 4/6) very shaly silty clay loam; few, medium, light brownish-gray (10YR 6/2) mottles, massive; very firm; 50 percent flat and rounded, olive-brown shale fragments that have a maximum width of 2 inches; many black faces on surface of shale; strongly acid; gradual, wavy boundary.

Cx—38 to 50 inches, yellowish-red (5YR 4/6) silty clay loam; few, medium, light brownish-gray (10 YR 6/2) mottles; massive; firm, but less compact than Bx horizon; 15 percent shale fragments that have a maximum width of 2 inches; strongly acid.

The B horizon is silt loam or silty clay loam and ranges from yellowish red to strong brown. This horizon commonly has a few mottles in the lower part. The fragipan ranges in depth from 20 to 27 inches. It commonly is 20 to 50 percent shale. The deposits of alluvium are 4 to 8 feet thick. Natural reaction in unlimed areas is strongly acid to very strongly acid.

The B horizon of these soils is redder than the defined range for the series, but this difference does not alter their use or behavior.

Monongahela soils are on terraces above the bottomlands occupied by Huntington, Lindside, and Melvin soils and below the surrounding hills occupied by Berks, Weikert, Opequon, and Chilhowie soils.

Monongahela silt loam, 2 to 6 percent slopes (MhB).—This is the only Monongahela soil mapped in the county. Included in mapping were some nearly level and strongly sloping areas. Also included were a few small areas of Berks soils that are on the breaks between terrace levels.

This soil is suited to all locally grown crops. All of it has been cleared and used for crops. A seasonally high water table limits use for alfalfa and orchard fruits. In places water from adjacent upland slopes needs to be diverted to help reduce seepage and eliminate wet spots. These soils are easily compacted if worked or grazed when wet. Choosing a suitable cropping system, using sodded waterways, helps to control runoff and erosion. Capability unit IIe-13.

Opequon Series

The Opequon series consists of shallow, well-drained, fine-textured soils. These soils formed in material weathered from relatively pure limestone. They are in the Great Limestone Valley in the southwestern part of the county. Opequon soils are mapped only in an undifferentiated unit with Chilhowie very rocky soils.

In a representative profile the surface layer is brown very rocky light silty clay about 4 inches thick. The subsoil extends to a depth of 16 inches. The upper 2 inches is dark-brown light silty clay and the lower 10 inches is yellowish-red to red clay that is sticky and plastic when wet. Below is hard whitish limestone.

Opequon soils are difficult to work, but they are fertile. Permeability is moderately slow. Available moisture capacity is very low or low.

Opequon soils are suited to pasture. Droughtiness, shallowness, and rock outcrops limit suitability for crops. Many areas are reverting to woods.

Representative profile of Opequon very rocky silty clay in an area of Chilhowie and Opequon very rocky silty clays, 2 to 12 percent slopes, one-half mile west of Middleway:

Ap—0 to 4 inches, brown (7.5YR 4/2) very rocky light silty clay; moderate, fine and medium, blocky structure; firm; 15 percent limestone outcrops; many fine roots; mildly alkaline; clear, smooth boundary.

B1—4 to 6 inches, dark-brown (7.5YR 4/4) light silty clay; moderate, medium, subangular blocky structure; firm, hard, slightly plastic and slightly sticky; many fine roots; neutral; clear, smooth boundary

B21t—6 to 11 inches, yellowish-red (5YR 4/6) clay; strong, medium and fine, blocky structure; firm, hard, plastic and sticky; few to common fine roots; medium, patchy clay films; neutral; gradual, smooth boundary.

B22t—11 to 16 inches, yellowish-red (5YR 4/8) to red (2.5YR 4/6) clay; strong, medium and fine, blocky structure; firm, hard, plastic and sticky; few fine roots; thick continuous clay films; mildly alkaline; few lime nodules; abrupt, irregular boundary.

R—16 inches, hard whitish limestone.

The Bt horizon is silty clay or clay that ranges from red to yellowish red. Content of coarse fragments ranges from less than 5 percent to about 25 percent. Depth to bedrock is variable and ranges from 12 to 20 inches. Natural reaction ranges from slightly acid to mildly alkaline.

Opequon soils are associated in a mixed pattern with less red Chilhowie soils. They are also associated with deeper Hagerstown and Frederick soils, shaly Berks and Weikert soils, and loamy Blairton and Monongahela soils

Quarries

Quarries (Qu) are scattered throughout the limestone parts of the county. The limestone has been removed, leaving large open pits that have vertical walls. Surrounding the quarries are areas of mixed rock and soil material that was removed during the quarrying operation (fig. 10).

The quarries vary in depth from 15 to 20 feet to 100 feet or more. Only a few are now in operation. Many have been abandoned and some have filled with water. None have been put to any practical use after quarrying stopped. Capability unit not assigned.

Figure 10.—**Limestone quarry and surrounding soil material disturbed during operation.**

Steep Rock Land

Steep rock land (SrF) consists of very steep areas that have massive outcropping ledges. It is in bands of outcropping sandstone and quartzite ledges along the upper slopes of Blue Ridge. Included in mapping were areas of less steeply sloping soils below these ledges. These areas are nearly completely covered with loose boulders that have broken from the ledges. Also included were nearly vertical limestone cliffs along the Potomac and Shenandoah Rivers and a few small steep limestone outcrops throughout the limestone valley.

Most areas of Steep rock land are wooded. Trees are generally of the less desirable species and of poor quality, and this growth is slow. This land is not suited to commercial production of wood crops. It is used as scenic areas, hiking trails, and landmarks. Capability unit VIIIs-1.

Weikert Series

The Weikert series consists of shallow, well-drained, shaly soils. They formed on uplands in material weathered from acid shale, siltstone, and thin, interbedded sandstone. These soils are in the western part of the county near Opequon Creek and east of the Shenandoah River near Harpers Ferry.

In a representative profile the surface layer is thin and is very dark gray shaly silt loam. The subsurface layer is light olive-brown shaly silt loam about 5 inches thick. The subsoil is brown very shaly silt loam about 6 inches thick. The substratum is brown very shaly silt loam about 6 inches thick. Below this is shale bedrock.

Weikert soils are easily worked, but they are shaly and droughty. Natural fertility is moderately low. Available moisture capacity is very low or low. Permeability is moderately rapid.

These soils are not suited to cultivated crops. They are suited to pasture and woodland.

Representative profile of Weikert shaly silt loam, 25 to 45 percent slopes, in a wooded area one-half mile southwest of Silver Grove near Keys Ferry Acres:

O1—1 inch to ½ inch, loose hardwood leaves.
O2—½ inch to 0, black mull mixed with some mineral material
A1—0 to 1½ inches, very dark gray (10YR 3/1) shaly silt loam; moderate, fine, granular structure; loose; 20 percent shale fragments up to 1 inch in length;

abundant roots; strongly acid; abrupt, irregular boundary.

A2—1½ to 6 inches, light olive-brown (2.5Y 5/4) shaly silt loam; weak, fine, subangular blocky structure and very weak, thin, platy structure; very friable, 20 percent shale fragments up to 1 inch in length; many roots; strongly acid; clear, wavy boundary.

B2—6 to 12 inches, brown (10YR 5/3) very shaly silt loam; weak, fine and medium, subangular blocky structure; friable; 50 percent shale fragments up to 3 inches in length; common roots; strongly acid; gradual, wavy boundary.

C—12 to 18 inches, brown (10YR 5/3) very shaly silt loam; massive; friable; 80 to 90 percent shale fragments up to 5 inches in length; few fine roots; strongly acid; abrupt, irregular boundary.

R—18 inches, shale.

The B horizon ranges from shaly silt loam to very shaly silt loam and from brown to light olive brown. Content of coarse fragments ranges from 35 to 65 percent in the B horizon. Depth to bedrock ranges from 10 to 20 inches. Natural reaction ranges from very strongly acid to medium acid, but lime dust from nearby quarries has decreased the acidity of the surface layer in many areas east of the Shenandoah River.

Weikert soils are associated with the somewhat poorly drained Blairton soils, and extensive areas are in mixed patterns with the moderately deep Berks soils. They are next to deeper Monongahela soils and next to deeper, more sandy Dekalb and Laidig soils. Also, they are next to soils over limestone, such as Hagerstown and Opequon soils. Weikert soils are less clayey than the Chilhowie soils. They are more silty throughout than Edgemont soils and contain shale fragments that are lacking in those soils.

Weikert shaly silt loam, 6 to 12 percent slopes, severely eroded (WeC3).—This soil has lost most of the original surface layer through erosion, and the soil is not so deep to bedrock as the soil described as representative of the series. This soil is between gently sloping hilltops and moderately steep side slopes. Included in mapping were some moderately eroded spots and a few very shaly areas.

This soil is better suited to pasture or woodland than to cultivated crops. Severe erosion, low fertility, and droughtiness limit use for cultivated crops. This soil commonly is too droughty for good bluegrass pasture. Good pasture management is needed to maintain cover and prevent excessive losses of soil. Capability unit VIe-31.

Weikert shaly silt loam, 12 to 25 percent slopes, severely eroded (WeD3).—This soil has a profile similar to that described as representative for the series, but it has more shale on the surface. It is on hillsides. Included in mapping were some very shallow areas and areas where raw shale is exposed and the soil does not have the usual profile. Also included are some shallow gullies.

Most of this soil was in crops, but because of erosion, all areas are now in pasture or are wooded. This soil is better suited to trees than to more intensive uses. Capability unit VIIe-3.

Weikert shaly silt loam, 25 to 45 percent slopes (WeF).—This soil has the profile described as representative for the series. It is steep or very steep and is on sides of ridges. Included in mapping were some severely eroded areas and a few shale ledges.

Nearly all of this soil is in woodland. Capability unit VIIe-3.

Use and Management of Soils

The first part of this section describes general guidelines for managing soils for crops and pasture. Then, the capability classification used by the Soil Conservation Service is explained and outlined. Next, the estimated yields of crops are listed. To determine the capability classification of a soil, refer to the "Guide to Mapping Units" at the end of this survey. Detailed information about the management of soils can be found in the section "Descriptions of the Soils." The last part of this section discusses use of the soils for woodland, for wildlife, in engineering works, and for town and country planning.

Managing Soils for Crops and Pasture

The crops grown in Jefferson County are corn, small grain, and forage crops. Apple and peach orchards are also prominent.

The major use and management concerns vary in different parts of the county. In the Great Limestone Valley the dominant soils are silty to clayey, shallow to deep, and most areas are well drained. The major concerns of management are rockiness and steepness of slope. Management of the less rocky soils is concerned mainly with the improvement and maintenance of fertility and the control of erosion. Major farming enterprises are orchards, dairying, and the raising of cattle and horses.

On the Blue Ridge very little farming is done. Most of the soils are moderately deep and deep, well drained, and sandy. Many areas are stony. These soils are mainly used for woodland, and many areas are used for summer homesites. The use of these soils for woodland is discussed in the subsection "Use of Soils for Woodland."

Management is needed on the soils used for crops to help control erosion, to provide drainage, to maintain the content of organic matter, to improve or maintain tilth, and to increase fertility.

Suitable practices for the control of erosion on soils, such as Duffield, Frankstown, and Hagerstown soils, are growing a winter cover crop; stripcropping; growing grasses, legumes, or both in a long-term conservation cropping system with tilled crops; and contour farming. Other practices include growing grass waterways; constructing diversions and interceptor ditches; regulating grazing; applying lime and fertilizer as needed; and using minimum tillage. Minimum tillage is generally needed on short slopes of the Hagerstown soils, where contour cultivation is difficult.

Some of the soils in the county, such as Blairton, Lindside, and Melvin soils, need drainage to produce optimum yields of crops. Wet soils are slower to warm in spring than better drained soils. On such soils, tillage is delayed and farm machinery often bogs down. Drainage can be improved by constructing open ditches, smoothing the land, and installing tile. Tile can be used to remove excess water in drainageways, seeps, and depressions. Shallow waterways can be used to remove surface water from depressions in the field.

The content of organic matter in soils, such as Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded, is so low that management is needed to improve and maintain tilth. Returning crop residue to the soil reduces crusting and evaporation, adds organic matter,

makes the soil more absorbent, and makes the soil easier to till. Growing a grass-legume crop to plow under as green manure helps to improve tilth and soil structure and makes the soil more permeable. Soils that are tilled when wet lose their granular structure and become cloddy and hard when dry. Bare soils tend to develop a hard surface crust upon drying after a heavy rain. This surface crust hinders the emergence of new seedlings and results in sparse stands of plants in places. Clayey soils are difficult to plow and harrow. Chilhowie soils that have a clayey surface layer are normally plowed in fall or winter. The alternate freezing and thawing during winter makes preparation of the seedbed easier in the spring. Weed control is more difficult on clayey soils because the narrow moisture range limits the length of time for cultivation.

The application of lime, livestock manure, and commercial fertilizer improves tilth and productivity, and should be done according to needs indicated by soil tests. Consideration needs to be given to past use of the soil as well as to the potential of the soil to produce the desired yields.

Hay and pasture occupy a large acreage in Jefferson County. A grass-legume mixture that is most commonly used consists of alfalfa, orchard-grass, bromegrass, and timothy. Red clover, alsike clover, and birdsfoot trefoil are also grown in the county. Alfalfa grows better on well-drained soils, such as Duffield and Hagerstown, than on wet Melvin soils. In some years the crop is lost because of flooding. Ladino clover is more water-tolerant than alfalfa.

Fertilizer generally is needed to establish a stand of perennial pasture plants. Proper grazing and necessary brush and weed control insure good growth for a long period.

Apples and peaches occupy a large acreage and are a major cash crop grown in the county. They grow better on deep, well-drained soils weathered from limestone or limestone-mixed material, such as Duffield, Frederick, Frankstown, and Hagerstown, than on other soils in the county. Frost pockets along some intermittent drainageways and in depressions are a severe hazard. Rock outcrops, a clayey surface texture, and moderate steepness limit the use of equipment on some soils.

Capability Grouping

Some readers, particularly those who farm on a large scale, may find it practical to use and manage some of the different kinds of soil on their farm together. These readers can make good use of the capability classification system, a grouping that shows, in a general way, the suitability of soils for most kinds of farming.

The grouping is based on limitations of soils when used for field crops, the risk of damage when they are farmed, and the way the soils respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops, or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations for trees or engineering use.

In the capability system, all kinds of soil are grouped at three levels: the class, the subclass, and the unit. To determine placement of any mapping unit in the grouping, refer to the "Guide to Mapping Units" at the back of this survey.

Capability Classes are the broadest grouping and are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, so shallow, or otherwise so limited that they do not produce worthwhile yields of crops, forage, or wood products.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Following is a descriptive outline of the system as it applies in Jefferson County.

Class I. Soils that have few limitations that restrict their use.

(No subclass)

Unit I-6. Deep, well-drained, medium-textured soils on bottom lands that flood infrequently.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

Subclass IIe. Soils subject to moderate erosion if they are not protected.

Unit IIe–1. Deep, well-drained, gently sloping, medium-textured and moderately fine textured soils on uplands underlain by limestone.

Unit IIe–4. Deep, well-drained, gently sloping, medium-textured gravelly soils formed on terraces in material derived from sandstone and shale.

Unit IIe–10. Moderately deep, well-drained, gently sloping, medium-textured shaly soils formed on uplands in material from shale and siltstone.

Unit IIe–13. Deep, moderately well drained, gently sloping, medium-textured soils that have a fragipan in the lower part of the subsoil and that formed on terraces.

Subclass IIw. Soils that have moderate limitations because of excess water.

Unit IIw–6. Deep, well-drained, nearly level, medium-textured and moderately coarse textured soils on bottom lands subject to periodic flooding.

Unit IIw–7. Deep, moderately well drained, nearly level, medium-textured soils on bottom lands subject to periodic flooding.

Class III. Soils that have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.

Unit IIIe–1. Deep, well-drained, strongly sloping, medium-textured and moderately fine textured soils on uplands underlain by limestone.

Unit IIIe–4. Deep, well-drained, strongly sloping, medium-textured, gravelly soils on footslopes and terraces.

Unit IIIe–12. Moderately deep, well-drained, strongly sloping, moderately coarse textured, channery soils on uplands underlain by sandstone.

Unit IIIe–30. Moderately deep, well-drained, gently sloping, clayey soils on uplands underlain by limestone.

Unit IIIe–32. Moderately deep and shallow, well-drained, gently sloping, medium-textured, shaly soils on uplands underlain by shale.

Subclass IIIw. Soils that have severe limitations because of excess water.

Unit IIIw–1. Deep, poorly drained, nearly level, medium-textured soils on bottom lands subject to periodic flooding.

Unit IIIw–5. Moderately deep, somewhat poorly drained, gently sloping, moderately fine textured soils on uplands underlain by shale.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.

Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.

Unit IVe–1. Deep, well-drained, strongly sloping and moderately steep, medium-textured to fine-textured soils on uplands that also contain chert and shale and are underlain by limestone.

Unit IVe–3. Deep, well-drained, strongly sloping and moderately steep, medium-textured, gravelly soils on foot slopes and terraces.

Unit IVe–5. Moderately deep, well-drained, moderately steep, moderately coarse textured, channery soils on uplands underlain by sandstone.

Unit IVe–30. Moderately deep, well-drained, strongly sloping, clayey soils on uplands underlain by limestone.

Unit IVe–32. Moderately deep and shallow, well-drained, strongly sloping, medium-textured, shaly soils on uplands underlain by acid shale.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture, woodland, or wildlife.

Subclass VIe. Soils severely limited, chiefly by risk of erosion, if protective cover is not maintained.

Unit VIe–1. Moderately deep and deep, well-drained, strongly sloping and moderately steep, medium-textured and fine-textured soils on uplands underlain by limestone.

Unit VIe–2. Deep, well-drained, moderately steep and steep, medium-textured, gravelly soils on terraces.

Unit VIe–4. Moderately deep, well-drained, steep, moderately coarse textured, channery soils on uplands underlain by sandstone.

Unit VIe–31. Moderately deep and shallow, well-drained, strongly sloping and moderately steep, medium-textured, shaly soils on uplands underlain by shale.

Subclass VIw. Soils severely limited by excess water and generally unsuitable for cultivation.

Unit VIw–1. Deep, poorly drained to well-drained, nearly level, silty and sandy soils on bottom lands subject to frequent flooding.

Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by low moisture capacity, stones, or other features.

Unit VIs–1. Deep, well-drained, gently sloping to moderately steep, very rocky soils on uplands.

Unit VIs–2. Deep, well-drained, strongly sloping to moderately steep, very stony soils on uplands and foot slopes.

Class VII. Soils on uplands that have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to pasture, woodland, or wildlife.

Subclass VIIe. Soils very severely limited, chiefly by risk of erosion, if protective cover is not maintained.

Unit VIIe–1. Deep, well-drained, moderately steep, medium-textured, shaly soils underlain by limestone.

Unit VIIe–2. Moderately deep, well-drained, steep, moderately coarse textured, channery soils underlain by sandstone.

Unit VIIe–3. Shallow, excessively drained, moderately steep and steep, medium-textured, shaly soils.

Subclass VIIs. Soils very severely limited by moisture capacity, stones, or other soil features.

Unit VIIs–1. Shallow to deep, well-drained, strongly sloping to steep, very rocky soils underlain by limestone.

Unit VIIs–2. Deep, well-drained, strongly sloping to steep, very stony soils underlain by quartzite and sandstone.

Unit VIIs–4. Deep, well-drained, gently sloping to moderately steep, extremely rocky soils.

Class VIII. Soils and landforms that have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes.

Subclass VIIIs. Rocks or soil material that have little potential for production of vegetation.

Unit VIIIs–1. Steep or very steep rock land useful mainly as scenic spots and as landmarks.

Estimated Yields

Table 2 shows estimated yields for major grain and forage crops and for permanent pasture grown on the soils in Jefferson County. The yields are based on records kept by farmers in the county, on recent reports of the U.S. Census of Agriculture, and on the observations and experiences of representatives of the Soil Conservation Service and others who have a knowledge of the soils and crops in the area. Yields are based on an average 10-year period for two levels of management and are shown in columns A and B of that table.

Yields in columns A are estimated for the management now used by farmers. Those in columns B are estimated for the best management practical on the soils, including proper kinds and amounts of fertilizer.

The management needed to obtain the yields in columns B includes liming to the pH required for the crop, applying fertilizer according to needs determined by soil tests, choosing a suitable cropping system, and using necessary soil and water conservation practices, including drainage where necessary. Animal residue generally is not used extensively, except on dairy farms.

The management needed to obtain the estimated yields in columns B for pasture includes the use of enough fertilizer to provide phosphate and potash as needed and enough lime to maintain a pH of 6.0 to 6.5. Irrigation was not considered.

The response to improved management is better on soils in the Duffield series that are deep and have a favorable soil texture and high available moisture capacity, than on soils in the Chilhowie series that are relatively high in natural fertility but have poor physical properties.

Use of Soils as Woodland [2]

Woodland in Jefferson County occupies about 32,000 acres, or 24 percent of the total area. About 500 acres are Federally owned, and the remainder is privately owned (*4*). About a fourth of the wooded land is in small scattered farm woodlots in the Great Limestone Valley. Most of the remainder is in large tracts on Blue Ridge and foothills east of the Shenandoah River.

[2] By ROSS H. MELLINGER, woodland conservationist, Soil Conservation Service.

The most common forest type or natural association of tree species is oak-hickory that makes up about three-fourths of the wooded area (*4*).

Wood crop production in Jefferson County is relatively unimportant because of the small extent of wooded land, the small size of individually owned tracts, and the increasing use of wooded land for recreation and homesites.

Soil properties have a strong influence on tree growth and management of woodland. Differences in depth and texture of the soil, for example, affect the available moisture capacity and thereby influence the growth rate of trees. Other features, such as slope, aspect, stoniness, rockiness, or a clayey subsoil, also affect management for wood crop production.

The soils of Jefferson County are rated for woodland suitability in table 3. Each soil is rated for potential productivity of the important wood crops, hazards and limitations that affect management and species suitability. All of these items are explained in the following paragraphs.

The *productivity* of each soil is rated as *excellent*, *very good*, *good*, *fair*, or *poor* for growing trees. Corresponding range of site index, the height in feet attained at 50 years of age by a particular species or group of species in a forest stand, is also shown for each rating. By referring to table 4 these productivity ratings can be translated into potential yields for oaks, yellow poplar, or Virginia pine. Table 4 gives the yields per acre for these selected species. The information given in table 4 was compiled from USDA Technical Bulletin 356 and 560; SE Forest Exp. Station Paper No. 124 (*7*, *14*, *9*). The dashes in the columns of this table indicate that data was not available or does not apply.

On some soils productivity varies from one area to another because of aspect of slopes. Slopes that face in a northerly or easterly direction are shown as *north;* slopes that face in a southerly or westerly direction are shown as *south.*

Erosion Hazard refers to the potential hazard of soil losses from gullying incurred in managing and harvesting tree crops. As rated here it is associated with logging roads and skid trails.

Equipment Limitations are rated on the basis of soil characteristics that prohibit the use of equipment commonly used in tending and harvesting trees. Soil characteristics having the most limiting effect are internal drainage, texture, slope and number and size of stones.

Seedling Mortality refers to the expected losses of natural or planted tree seedlings in a normal season, exceeding plant competition. Available moisture capacity of soils is the main determining factor in the rating.

Plant Competition from brush, grass, vines, or other undesirable plants delays or prevents the establishment of planted or naturally occurring desirable kinds of trees in places. This is related to the inherent fertility, available moisture capacity, and the high water table.

Ratings for *plant competition*, *seedling mortality*, *erosion hazard*, and *equipment limitations* are expressed as *slight*, *moderate*, or *severe*, depending upon the degree of hazard or limitation. The cause of moderate or severe limitations for erosion hazards, equipment limitations, and seedling mortality is given.

TABLE 2.—*Estimated average acre yields of principal crops*

[Yields in columns A are those expected under ordinary management; those in columns B are yields to be expected under improved management. Absence of yield indicates crop is not well suited at specified level of management. Soils that are severely limited by steep slopes, rockiness, or very severe erosion are considered not suitable for crops or pastures and do not appear in the table]

Soil	Corn		Wheat		Oats		Hay: Clover-grass		Hay: Alfalfa-grass		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu	*Bu.*	*Bu.*	*Bu*	*Bu.*	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Alluvial land											60	125
Alluvial land, marl substratum											70	140
Ashton loam	80	135	25	50	40	80	2.5	3.5	2.5	5.0	115	165
Benevola silty clay loam, 2 to 6 percent slopes	50	125	25	45	35	70	2.5	3.5	2.8	5.0	100	150
Benevola clay, 6 to 12 percent slopes, severely eroded	40	100	20	35	30	65	2.0	3.0	2.3	4.5	85	135
Benevola very rocky silty clay, 6 to 12 percent slopes											75	130
Benevola very rocky silty clay, 12 to 25 percent slopes											70	125
Berks shaly silt loam, 2 to 6 percent slopes	35	85	20	35	30	60	1.5	2.8	2.0	3.3	60	125
Berks-Weikert shaly silt loams, 2 to 6 percent slopes [2]	30	60	18	30	28	43	1.3	2.5	1.8	2.8	55	100
Berks-Weikert shaly silt loams, 6 to 12 percent slopes	30	55	15	28	25	40	1.3	2.0	1.8	2.5	50	90
Berks-Weikert shaly silt loams, 12 to 25 percent slopes											50	80
Blairton silt loam, 2 to 6 percent slopes	30	75	18	35	20	60	1.5	2.5			70	125
Braddock gravelly loam, 2 to 6 percent slopes	50	115	20	45	30	75	2.3	3.3	2.5	4.5	75	150
Braddock gravelly loam, 6 to 12 percent slopes	45	110	18	40	28	70	2.0	3.0	2.3	4.0	70	135
Braddock gravelly loam, 6 to 12 percent slopes, severely eroded	35	90	15	33	23	58	1.8	2.5	2.0	4.0	60	125
Braddock gravelly loam, 12 to 25 percent slopes	35	95	18	35	25	60	2.0	2.8	2.3	4.0	65	130
Braddock gravelly loam, 12 to 25 percent slopes, severely eroded											50	115
Braddock gravelly loam, 25 to 35 percent slopes											55	120
Chilhowie silty clay, 2 to 6 percent slopes	40	75	18	28	30	45	1.5	2.5	2.0	3.5	85	115
Chilhowie silty clay, 6 to 12 percent slopes	35	70	15	25	28	43	1.5	2.3	2.0	3.3	80	115
Chilhowie clay, 6 to 12 percent slopes, severely eroded											70	105
Chilhowie and Opequon very rocky silty clays,[2] 2 to 12 percent slopes											60	90
Chilhowie and Opequon very rocky clays, 6 to 12 percent slopes, severely eroded											50	80
Chilhowie and Opequon very rocky clays, 12 to 25 percent slopes, severely eroded											50	70
Clifton very stony silt loam, 6 to 20 percent slopes											75	125
Dekalb channery fine sandy loam, 6 to 12 percent slopes	35	70	18	28	30	50	1.5	2.0	1.8	3.0	55	115
Dekalb channery fine sandy loam, 12 to 25 percent slopes	30	65	15	23	28	45	1.3	2.0	1.5	3.0	50	100
Dekalb channery fine sandy loam, 25 to 35 percent slopes											50	90
Duffield silt loam, 2 to 6 percent slopes	60	130	20	50	40	80	2.5	3.5	2.5	5.0	105	165
Duffield silt loam, 6 to 12 percent slopes	55	125	20	40	38	75	2.3	3.3	2.3	4.5	100	140
Duffield silt loam, 6 to 12 percent slopes, severely eroded	45	100	15	35	30	55	2.0	3.0	2.0	4.0	85	125
Duffield silt loam, 12 to 25 percent slopes, severely eroded											80	120
Frankstown shaly silt loam, 2 to 6 percent slopes	50	125	23	45	35	75	2.5	3.5	2.8	4.5	100	155
Frankstown shaly silt loam, 6 to 12 percent slopes	50	120	20	40	33	70	2.3	3.5	2.5	4.5	95	150

See footnotes at end of table.

TABLE 2.—*Estimated average acre yields of principal crops*—Continued

Soil	Corn		Wheat		Oats		Hay				Permanent pasture	
							Clover-grass		Alfalfa-grass			
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Frankstown shaly silt loam, 6 to 12 percent slopes, severely eroded	40	110	15	35	28	60	2.0	3.0	2.3	4.0	85	135
Frankstown shaly silt loam, 12 to 25 percent slopes	45	105	15	35	30	55	2.0	3.0	2.3	4.0	90	135
Frankstown shaly silt loam, 12 to 25 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	80	125
Frankstown very rocky silt loam, 6 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	60	125
Frankstown very rocky silt loam, 12 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	60	115
Frankstown very rocky silt loam, 12 to 25 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	55	100
Hagerstown silt loam, 2 to 6 percent slopes	65	130	28	50	40	80	2.5	3.5	2.5	5.0	105	165
Hagerstown silt loam, 6 to 12 percent slopes	55	120	25	40	38	70	2.3	3.0	2.5	4.5	100	135
Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	45	110	20	40	30	70	2.0	3.0	2.3	4.5	85	135
Hagerstown and Frederick cherty silt[2] loams, 2 to 6 percent slopes	65	125	25	40	40	70	2.5	3.5	2.5	5.0	105	160
Hagerstown and Frederick cherty silt loams, 6 to 12 percent slopes	55	120	20	35	38	65	2.3	3.0	2.3	4.5	100	140
Hagerstown and Frederick very rocky silt loams, 2 to 6 percent slopes	----	----	----	----	----	----	----	----	----	----	70	125
Hagerstown and Frederick very rocky silt loams, 6 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	65	120
Hagerstown and Frederick very rocky silt loams, 12 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	60	115
Hagerstown and Frederick cherty silty clay loams, 6 to 12 percent slopes, severely eroded	45	100	15	30	30	55	2.0	3.0	2.0	4.0	85	135
Hagerstown and Frederick very rocky silty clay loams, 6 to 12 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	55	100
Hagerstown and Frederick very rocky silty clay loams, 12 to 25 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	50	95
Huntington silt loam	80	130	25	45	40	80	2.3	3.5	2.5	4.5	115	170
Huntington silt loam, local alluvium	85	135	28	45	43	80	2.5	3.5	2.8	5.0	120	175
Laidig gravelly loam, 6 to 12 percent slopes	45	100	18	35	28	60	1.3	3.0	2.0	4.0	65	135
Laidig gravelly loam, 12 to 25 percent slopes	40	90	15	30	23	60	1.0	2.5	1.8	3.5	55	120
Laidig very stony loam, 6 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	45	115
Laidig very stony loam, 12 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	40	110
Landes fine sandy loam	75	130	25	45	40	80	2.0	3.5	2.5	4.5	110	160
Lindside silt loam	70	130	20	40	35	65	2.3	3.5	2.5	4.0	110	160
Lindside silt loam, local alluvium	70	130	20	40	35	65	2.3	3.5	2.5	4.0	110	165
Melvin silt loam	35	115	20	----	30	60	2.0	3.0	----	----	90	135
Monongahela silt loam, 2 to 6 percent slopes	40	90	18	40	25	60	1.5	3.0	1.5	3.5	70	135
Weikert shaly silt loam, 6 to 12 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	50	85

[1] Cow-acre-days refers to the number of days in a year one cow, horse, or steer, or 7 sheep can graze an acre without injury to pasture.

[2] Yields are essentially the same for each component.

TABLE 3.—*Woodland suitability*

Soil series and map symbols	Management concerns			
	Erosion hazard	Equipment restrictions	Seedling mortality	Plant competition for— Conifers
Alluvial land: Ad.[2]				
Alluvial land, marl substratum: Am	Slight	Severe: high water table.	Severe: high water table.	Severe
Ashton: As	Slight	Slight	Slight	Severe
Benevola:				
BaB	Slight	Moderate: clayey subsoil.	Slight	Severe
BcC3, BeC	Moderate: slope.	Moderate: clayey subsoil.	Slight	Severe
BeD	Severe: slope.	Severe: clayey subsoil; slope.	Slight	Severe
Berks: BkB	Slight	Slight	Slight	Moderate
Berks-Weikert:				
B1B, B1C	Slight	Slight	Moderate: droughty.	Slight
B1D; north aspect	Slight	Moderate: slope	Moderate: droughty.	Moderate
B1D; south aspect	Slight	Moderate: slope	Severe: droughty.	Slight
Blairton: BnB	Slight	Moderate: high water table.	Slight	Severe
Braddock:				
BrB, BrC, BrC3	Slight	Slight	Slight	Moderate
BrD, BrD3, BrE	Slight	Moderate: slope	Slight	Moderate
Chilhowie:				
CdB	Slight	Moderate: clayey subsoil.	Slight	Severe
CdC, CeC3	Moderate: texture, slope.	Moderate: clayey subsoil.	Slight	Severe

See footnotes at end of table.

of soils

Management concerns—Con. Plant competition for—Con. Hardwoods	Species suitability [1] Natural stands	Species suitability [1] Tree planting	Important natural wood crops [1]	Productivity Site quality	Productivity Site index
Severe	Yellow-poplar, [3] pin oak	Yellow-poplar [3]	Pin oak Yellow-poplar [3]	Excellent Excellent	95+ 95+
Moderate	Yellow-poplar, black walnut, white ash, red oak.	Yellow-poplar, black walnut, white pine.	Yellow-poplar Upland oaks	Excellent Excellent	95+ 85+
Moderate	Yellow-poplar, black walnut, white ash, red oak, white oak, black locust.	Yellow-poplar, black walnut, black locust, white pine.	Yellow-poplar Upland oaks	Excellent Excellent	95+ 85+
Moderate	Yellow-poplar, black walnut, white ash, red oak, white oak, black locust.	Yellow-poplar, black walnut, black locust, white pine.	Yellow-poplar Uplands oaks	Excellent Excellent	95+ 85+
Moderate	Yellow-poplar, black walnut, white ash, red oak, white oak, black locust.	Yellow-poplar, black walnut, black locust, white pine.	Yellow-poplar Upland oaks	Excellent Excellent	95+ 85+
Slight	Red oak, black oak, Virginia pine.	Virginia pine, white pine.	Upland oaks Virginia pine	Good Good	60–70 60–70
Slight	Red oak, black oak, Virginia pine, white pine.	Virginia pine, white pine.	Upland oaks Virginia pine	Fair Fair	55–65 55–65
Slight	Red oak, black oak, Virginia pine, white pine.	Virginia pine, white pine.	Upland oaks Virginia pine	Good Good	60–70 60–70
Slight	Chestnut oak, Virginia pine, white pine.	Virginia pine, white pine.	Upland oaks Virginia pine	Fair Fair	50–60 50–60
Moderate	Red oak, white oak, black oak.	Virginia pine, white pine.	Upland oaks	Good	65–75
Slight	White oak, black oak, red oak, Virginia pine.	White pine, Virginia pine.	Upland oaks	Good	65–75
Slight	White oak, black oak, red oak, Virginia pine.	White pine, Virginia pine.	Upland oaks	Good	65–75
Moderate	Red oak, white oak, black oak, black walnut, yellow-poplar, black locust.	Yellow-poplar, black locust, Virginia pine, white pine.	Upland oaks Yellow-poplar	Good Good	65–75 70–80
Moderate	Red oak, white oak, black oak, black walnut, yellow-poplar, black locust.	Yellow-poplar, black locust, Virginia pine, white pine.	Upland oaks Yellow-poplar	Good Good	65–75 70–80

TABLE 3.—*Woodland suitability*

Soil series and map symbols	Management concerns			
	Erosion hazard	Equipment restrictions	Seedling mortality	Plant competition for—
				Conifers
Chilhowie and Opequon: ChC, ClC3	Moderate: slope, texture.	Moderate: slope, clayey subsoil.	Slight to moderate.	Severe
ClD3	Severe: slope, texture.	Severe: slope, clayey subsoil.	Slight to moderate.	Severe
Clifton: CmD	Moderate: slope.	Slight to moderate slope.	Slight	Severe
Dekalb: DcC	Slight	Slight	Moderate: droughty.	Slight
DcD, DcE; north aspect	Slight	Moderate slope	Moderate: droughty.	Moderate
DcF, north aspect	Moderate: slope.	Severe slope	Moderate: droughty.	Moderate
DcD, DcE; south aspect	Slight	Moderate: slope	Severe: droughty.	Slight
DcF; south aspect	Moderate: slope.	Severe: slope	Severe: droughty.	Slight
Duffield: DgB, DgC, DgC3	Slight	Slight	Slight	Severe
DgD3	Moderate: slope.	Moderate: slope	Slight	Severe
Edgemont: EdD; south aspect	Slight	Moderate: slope	Slight	Slight
EdF; south aspect	Moderate: slope.	Severe: slope	Slight	Slight

See footnotes at end of table

of soils—Continued

Management concerns—Con.: Plant competition for—Con.: Hardwoods	Species suitability [1]: Natural stands	Species suitability [1]: Tree planting	Important natural wood crops [1]	Productivity: Site quality	Productivity: Site index
Moderate	Red oak, white oak, black walnut, yellow-poplar, black locust	Yellow-poplar, black locust, Virginia pine, white pine	Upland oaks Yellow-poplar	Good Good	65–75 70–80
Moderate	Red oak, white oak, black walnut, yellow-poplar, black locust.	Yellow-poplar, black locust, Virginia pine, white pine	Upland oaks Yellow-poplar	Good Good	65 75 70–80
Moderate	Red oak, black oak, white ash, black walnut.	Virginia pine, white pine, black walnut, yellow-poplar.	Upland oaks	Very good	70–80
Slight	Black oak, chestnut oak, Virginia pine, pitch pine, white pine	Virginia pine, white pine	Upland oaks	Fair	55–65
Slight	Red oak, black oak, white ash	Virginia pine, white pine	Upland oaks	Good	60–70
Slight	Red oak, black oak, white ash.	Virginia pine, white pine.	Upland oaks	Good	60–70
Slight	Chestnut oak, Virginia pine, pitch pine, white pine	Virginia pine, white pine.	Upland oaks Virginia pine	Poor Poor	50–60 50–60
Slight	Chestnut oak, Virginia pine, pitch pine, white pine.	Virginia pine, white pine.	Upland oaks Virginia pine	Poor Poor	50–60 50–60
Moderate	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, black locust, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Moderate	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, black locust, white pine	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Slight	Black oak, chestnut oak, Virginia pine, pitch pine.	Virginia pine, white pine.	Upland oaks	Fair	55–65
Slight	Black oak, chestnut oak, Virginia pine, pitch pine.	Virginia pine, white pine.	Upland oaks	Fair	55 65

461-488 73——4

TABLE 3.—*Woodland suitability*

Soil series and map symbols	Management concerns			
	Erosion hazard	Equipment restrictions	Seedling mortality	Plant competition for— Conifers
Frankstown: FbB, FbC, FbC3	Slight	Slight	Slight	Severe
FbD, FbD3, FbE3	Moderate: slope.	Moderate: slope	Slight	Severe
FcC	Slight	Moderate: slope	Slight	Severe
FcD, FcD3	Moderate: slope.	Moderate: slope	Slight	Severe
Hagerstown: HbB, HbC, HeC3	Slight	Moderate: slope, clayey subsoil.	Slight	Severe
HcC	Moderate: slope, texture.	Severe: slope, clayey subsoil, rocks.	Slight	Severe
Hagerstown and Frederick: Rated on Hagerstown. HfB, HfC, HhC3	Slight	Moderate: clayey subsoil.	Slight	Severe
HgB, HgC, HlC3	Slight	Moderate: clayey subsoil.	Slight	Severe
HgD, HlD3	Moderate: slope, texture.	Severe: clayey subsoil, rocks, slope.	Slight	Severe
Huntington: Hn, Ho	Slight	Slight	Slight	Severe
Laidig: LaC, LbC	Slight	Slight	Slight	Moderate
LaD, LbD	Slight	Moderate: slope	Slight	Moderate

See footnotes at end of table.

of soils—Continued

Management concerns—Con.	Species suitability [1]		Important natural wood crops [1]	Productivity	
Plant competition for—Con.	Natural stands	Tree planting		Site quality	Site index
Hardwoods					
Moderate	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, black locust, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Moderate	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, black locust, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Moderate	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, black locust, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Moderate	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar black walnut, black locust, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Severe	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, white pine.	Upland oaks Yellow poplar	Excellent Excellent	85+ 95+
Severe	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Severe	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Severe	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Severe	Red oak, white oak, black oak, white ash, yellow-poplar, black walnut, black locust.	Yellow-poplar, black walnut, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Severe	Red oak, yellow-poplar, white ash, black walnut.	Yellow-poplar, black walnut, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Slight	Red oak, black oak, yellow-poplar, white ash, black locust.	Yellow-poplar, white pine, Virginia pine.	Upland oaks Yellow-poplar	Good Good	65–75 70–80
Slight	Red oak, black oak, yellow-poplar, white ash, black locust.	Yellow-poplar, white pine, Virginia pine.	Upland oaks Yellow-poplar	Good Good	65–75 70–80

TABLE 3. *Woodland suitability*

Soil series and map symbols	Management concerns			
	Erosion hazard	Equipment restrictions	Seedling mortality	Plant competition for— Conifers
Landes: Lf	Slight	Slight	Slight	Severe
Lindside: Ln, Lo	Slight	Moderate: seasonal high water table.	Slight	Severe
Marl pit: Ma [4]				
Melvin: Me	Slight	Severe: high water table.	Severe: high water table	Severe
Monongahela: MhB	Slight	Moderate: seasonal high water table	Slight	Moderate
Quarries: Qu [4]				
Steep rock land: SrF	Slight	Severe: slope, rocks	Severe: droughty	Slight
Weikert: WeC3	Slight	Slight	Severe: droughty	Slight
WeD3, north aspect	Slight	Moderate: slope	Severe: droughty	Slight
WeF, north aspect	Moderate: slope.	Severe: slope	Severe: droughty	Slight
WeD3, south aspect	Slight	Moderate: slope	Severe: droughty	Slight
WeF, south aspect	Moderate: slope.	Severe: slope	Severe: droughty	Slight

[1] All species apply to the group of soil mapping units for which they are shown.
[2] Highly variable. Onsite determination needed.

of soils—Continued

Management concerns—Con.	Species suitability [1]		Important natural wood crops [1]	Productivity	
Plant competition for—Con. Hardwoods	Natural stands	Tree planting		Site quality	Site index
Severe	Red oak, yellow-poplar, black walnut, white ash.	Yellow-poplar, black walnut.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Severe	Red oak, yellow-poplar, white ash, black walnut.	Yellow-poplar, white pine.	Upland oaks Yellow-poplar	Excellent Excellent	85+ 95+
Severe	Pin oak, red maple	White pine	Pin oak	Excellent	95+
Moderate	Red oak, yellow-poplar, Virginia pine.	Virginia pine, white pine	Upland oaks Virginia pine	Good Good	65–75 65–75
Slight	Any species	Not suitable	Upland oaks	Very poor	<45
Slight	Red oak, black oak, Virginia pine, white pine.	Virginia pine, white pine	Upland oaks Virginia pine	Fair Fair	55–65 50–60
Slight	Red oak, black oak, Virginia pine, white pine.	Virginia pine, white pine	Upland oaks Virginia pine	Fair Fair	60–70 55–65
Slight	Red oak, black oak, Virginia pine, white pine.	Virginia pine, white pine	Upland oaks Virginia pine	Fair Fair	60–70 55–65
Slight	Black oak, chestnut oak, Virginia pine.	Virginia pine, white pine	Upland oaks Virginia pine	Poor Poor	50–60 45–55
Slight	Black oak, chestnut oak, Virginia pine.	Virginia pine, white pine	Upland oaks Virginia pine	Poor Poor	50–60 45–55

[3] On well-drained areas.
[4] Not suitable for woodland.

TABLE 4.—*Yields per acre from upland oaks, yellow-poplar, and Virginia pine in even-aged, fully stocked natural stands*

Productivity site quality	Age of stand	Merchantable volume				Virginia pine
		Upland oaks		Yellow-poplar		
	Years	*Cords* [1]	*Board feet* [2]	*Cords* [3]	*Board feet* [2]	*Cords* [4]
Excellent	30			32	17, 150	
	50			62	32, 150	
Very good	30	20	3, 350	27	8, 710	
	50	41	13, 750	52	24, 400	
Good	30	15	1, 750	21	5, 500	33
	50	33	9, 750	41	17, 620	54
Fair	30	10	850			19
	50	26	6, 300			31
Poor	30	6	350			[5] 11
	50	19	3, 250			[5] 18

[1] Unpeeled volume of merchantable stem to a top diameter of 4 inches outside barks. Values rounded off to nearest whole cord.
[2] According to international rule, ⅛ inch, for stems to a top diameter of 5 inches inside bark.
[3] Computed from peeled cubic feet volume of all trees 5 inches or more in diameter breast high and to a top diameter of 3 inches inside bark by using a converting factor of 86.4 cubic feet of solid wood per cord and rounding figures to nearest whole cord.
[4] Merchantable volume of all stems 4 inches up at diameter breast high to a 4-inch top diameter outside bark. Based on 100% density stands using a converting factor of 85 cubic feet equals one standard cord and rounding figures to nearest whole cord.
[5] Extrapolated values.

Species Suitability.—For each soil the most common commercial tree species preferred in the management of natural stands and for planting are listed. Species are not listed in order of priority or value. Those shown for planting are the most commonly used species that have been generally successful.

Use of Soils for Wildlife[3]

Because the county draws hunters and other recreation seekers from Washington, D.C., Baltimore, Maryland, and other cities, there is an increasing demand for areas developed as wildlife habitat.

This subsection gives a short description of present wildlife by the soil associations that are outlined on the General Soil Map. Soil associations are used because they have distinctive patterns of soils that strongly influence general land use. In turn, land use patterns, by controlling food and cover available, influence kinds and abundance of wildlife. Because of the broad range of most wildlife species, combinations of soil associations are used. The soils are also rated in table 5 according to their suitability for eight elements of wildlife habitat and for three major kinds of wildlife *(1)*. The subsection explains the ratings and discusses the elements and kinds of wildlife.

About four-fifths of the county acreage is made up of soil associations 1 through 6 in the Great Limestone Valley. Soils are mainly gently sloping and most are underlain by limestone. This area is the main farming and fruit growing section of the county. Less than 15 percent of the acreage is in small, scattered, wooded tracts.

Wildlife species common in the area are squirrels, bobwhite, mourning dove, raccoon, and rabbit. Skunk, opossum, and woodchuck are also numerous. Some white-tailed deer, ring-necked pheasant, and red and gray foxes are also found. The Shenandoah and Potomac Rivers along the eastern and northern borders and Opequon Creek along the western border provide extensive warm-water fishing. The rivers are used by waterfowl during the migratory seasons.

About one-fifth of the county acreage is made up of soil associations 7, 8, and 9 that are east of the Shenandoah River. Soils are mainly strongly sloping to steep, are underlain by acid sandstone and shale, and are mostly stony. Most of the acreage is wooded and the few cleared areas are reverting to woodland. Many summer homes are scattered throughout the area.

Wildlife species found in the area are squirrel, rabbit, skunk, opossum and woodchuck. A few white-tailed deer and ruffed grouse are also found.

Suitability of soils for wildlife habitat elements

In table 5 the soils and land types of Jefferson County are rated according to their relative suitability for the creation, improvement, or maintenance of eight wildlife habitat elements *(1)*. These ratings are based on limitations imposed by the characteristics or behavior of the soils, but do not consider present land use, size of area, or economic condition. Numerical ratings of 1 to 4 indicate the degree of soil suitability for a given habitat element. Particular soil properties commonly impose different degrees of limitation for different habitat elements. Meanings of the numerical ratings used in table 5 are as follows:

1, *well suited;* 2, *suited;* 3, *poorly suited;* and 4, *not suited. Well suited* means soil limitations are negligible in the management of the designated habitat element. Generally, the intensity of management required for the creation, improvement, or maintenance of the habitat element is low, and satisfactory results are assured. *Suited* means soil limitations moderately affect the management

[3] By WILLIAM J. MELVEN, field biologist, Soil Conservation Service.

of the designated habitat element. Fairly frequent attention and a moderate intensity of management is required to achieve satisfactory results. *Poorly suited* means soil limitations are severe. The creation, improvement, or maintenance of the designated habitat element is difficult, sometimes expensive, and requires intensive management to attain satisfactory results. For short-term usage, some areas of these soils provide easy establishment and temporary habitat values. *Unsuited* means soil limitation is so extreme that it is highly impractical, if not impossible, to manage the designated habitat element.

The eight wildlife habitat elements rated in table 5 are defined in the following paragraphs:

Grain and seed crops refers to domestic grains or seed-producing annuals planted to produce food for wildlife. Examples are corn, sorghum, wheat, barley, millet, and soybeans.

Grasses and legumes refers to domestic perennial grasses and herbaceous legumes that are established by planting and that furnish wildlife food and cover. Examples are fescue, bluegrass, timothy, orchardgrass, reed canarygrass, clover, alfalfa, and sericea lespedeza.

Wild herbaceous upland plants refers to native or introduced perennial grasses and forbs (weeds) that provide food and cover principally to upland wildlife and that are established mainly through natural processes. Examples are indiangrass, wild ryegrass, oatgrass, pokeweed, strawberry, lespedeza, beggarweed, ragweed, goldenrod, and dandelions.

Hardwood woody plants refers to nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs (browse) or foliage used extensively as food by wildlife, and are commonly established naturally but that also are planted. Examples are oak, hickory, walnut, cherry, dogwood, poplar, grapevine, honeysuckle, and brier.

Coniferous woody plants refers to cone-bearing trees and shrubs, mostly evergreen, that are important shelter plants but that also provide browse and seeds. Locally adapted species include white pine, Virginia pine, and red cedar. These plants are commonly established naturally on bare soil or where plant cover is thin. Soil characteristics, such as shallowness, dryness, and other qualities that cause slow plant growth and delay closure of the canopy are an advantage for this habitat element.

On soils rated poorly suited, widely-spaced plants quickly, but temporarily, produce desirable growth characteristics. Management, however, is difficult at times because these soils are well suited to competing hardwoods that invade and overtop the conifers. Topping and thinning of fast-growing conifers are necessary for habitat management.

Wetland food and cover plants refers to annual and perennial, wild herbaceous plants in moist to wet sites, exclusive of submerged or floating aquatic plants that produce food or cover that is used mainly by wetland wildlife. Examples are smartweed, wild millet, rushes, sedges, reeds, wild rice, switchgrass, and cattails.

Shallow water developments refers to areas formed from impoundments, excavation, or devices for control of water. They generally do not exceed six feet in depth. Examples are low dikes and levees, shallow dugouts, level ditches, and devices for controlling the water level in marshy drainageways or channels.

Impoundments refers to dug-out water areas, depressions behind low dikes, or a combination of these that have water of suitable quality, of suitable depth, and in ample supply for maintenance of fish or wildlife. Examples are ponds built on nearly level land, that have at least one-fourth acre of surface area, an average depth of six feet in at least one-fourth of their area, and a dependable high water table or other source of water.

In table 5 the soils are also rated according to their suitability for three kinds of wildlife in the county. Ratings for the three classes of wildlife are based on the combined ratings for selected habitat elements described in the first part of the table. For example, the rating for openland wildlife is based largely on the ratings shown for grain and seed crops and for grasses and legumes, but the ratings for wild herbaceous plants on uplands, for hardwood and coniferous plants, and for other elements also are considered. In determining the suitability rating for woodland wildlife, extra consideration is given to the ratings for wild herbaceous plants and for hardwood and coniferous trees and shrubs. Because wetland wildlife must have wet or swampy areas, the rating for this kind of wildlife is based principally on the ratings listed for wetland food and cover plants, for shallow water developments and for impoundments. The three classes of wildlife given in table 5 are defined in the following paragraphs.

Openland wildlife refers to birds and mammals that normally live in cropland meadow, pasture, and areas overgrown with grasses, weeds, and shrubs. Examples are bobwhite quail, ring-necked pheasant, mourning dove, cottontail rabbit, meadow lark, killdeer, and field sparrow.

Woodland wildlife refers to birds and mammals that normally live in wooded areas. Examples are ruffed grouse, white-tailed deer, squirrel, raccoon, wood thrush, warbler, and vireo.

Wetland wildlife refers to birds and mammals that normally live in wet areas such as ponds, marshes, and swamps. Examples are duck, geese, heron, snipe, rail, coot, muskrat, mink, and beaver.

For information about limitations and use of the soils for access roads, buildings, and other structures needed in developing areas for wildlife habitat refer to the sections "Engineering Uses of the Soils" and "Use of Soils for Town and Country Planning."

Engineering Uses of the Soils [4]

This section is useful to those who need information about soils used as structural material or as foundations upon which structures are built. Some of those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

[4] By DAVID C. RALSTON, state conservation engineer, Soil Conservation Service.

TABLE 5.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*

[Absence of data indicates soils not rated or too variable to rate. Soils rated 1 are well suited; 2 suited; 3 poorly suited; and 4 unsuited]

Soils and map symbols	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild-herba-ceous upland plants	Hard-wood woody plants	Conif-erous woody plants	Wet-land food and cover plants	Shallow water de-velop-ments	Im-pound ments	Open-land wild-life	Wood-land wild-life	Wet-land wild-life
Alluvial land: Ad									2–3	2–3	4
Alluvial land, marl sub-stratum: Am									2	2–3	4
Ashton: As	1	1	1	1	3	4	4	4	1	1	4
Benevola:											
BaB, BcC3	2	2	1	1	3	4	4	4	1	2	4
BeC, BeD	4	3	2	2	2	4	4	4	3	2	4
Berks: BkB	2	2	2	2	2	4	4	4	2	2	4
Berks-Weikert:											
BlB, BlC	3	3	2	2	2	4	4	4	3	2	4
BlD	4	3	2	2	2	4	4	4	3	2	4
Blairton: BnB	3	3	2	1–2	2	3	4	2	3	2	4
Braddock:											
BrB, BrC	2	1	1	1	3	4	4	4	1	1	4
BrC3, BrD	3	2	1	1	3	4	4	4	2	2	4
BrD3, BrE	4	3	1	1	3	4	4	4	2	2	4
Chilhowie:											
CdB, CdC	2–3	1–2	1	1	3	4	4	4	2	1	4
CeC3	3	2–3	1	1	3	4	4	4	2	2	4
Chilhowie and Opequon:											
ChC, ClC3	4	3	1	1	3	4	4	4	3	2	4
ClD3	4	4	2	2	2	4	4	4	4	2	4
Clifton: CmD	4	3	1	1	3	4	4	4	4	1–2	4
Dekalb:											
DcC	2	2	2	2	2	4	4	4	2	2	4
DcD	3	2	2	2	2	4	4	4	2	2	4
DcE	4	3	2	2	2	4	4	4	3	2	4
DcF	4	4	2	2	2	4	4	4	3	2	4
Duffield:											
DgB, DgC	2	1	1	1	3	4	4	4	1	1	4
DgC3	3	2	1	1	3	4	4	4	2	2	4
DgD3	4	3	1	1	3	4	4	4	3	2	4
Edgemont:											
EdD	4	3	2	2	2	4	4	4	3	2	4
EdF	4	4	2	2	2	4	4	4	3	2	4
Frankstown:											
FbB, FbC	2	1	1	1	3	4	4	4	1	1	4
FbC3, FbD	3	2	1	1	3	4	4	4	1	2	4
FbD3	4	3	1	1	3	4	4	4	3	2	4
FbE3	4	4	1	1	3	4	4	4	3	2	4
FcC, FcD, FcD3	4	3	2	2	2	4	4	4	3	2	4
Hagerstown:											
HoB, HbC	2	1	1	1	3	4	4	4	1	1	4
HcC	4	4	1	1	3	4	4	4	4	3	4
HeC3	3	2	1	1	3	4	4	4	2	2	4

TABLE 5.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Soils and map symbols	Elements of wildlife habitat							Kinds of wildlife			
	Grain and seed crops	Grasses and legumes	Wild-herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Impoundments	Openland wildlife	Woodland wildlife	Wetland wildlife
Hagerstown and Frederick											
HfB, HfC	2	1	1	1	3	4	4	4	1	1	4
HgB, HgC, HgD, HlC3, HlD3	4	3	2	2	2	4	4	4	3	2	4
HhC3	3	2	1	1	3	4	4	4	2	2	4
Huntington:											
Hn	2	1	1	1	3	4	4	4	1	1	4
Ho	1	1	1	1	3	4	3–4	3–4	1	1	4
Laidig											
LaC	2	1	1	1	3	4	4	4	1	1	4
LaD	3	2	1	1	3	4	4	4	2	2	4
LbC, LbD	4	3	1	1	3	4	4	4	3	2	4
Landes: Lf	2	1	1	1	3	4	4	4	1	1	4
Lindside											
Ln	2	1	1	1	3	3	3	3	1	1	3
Lo	2	1	1	1	3	3	2–3	1–2	1	1	3
Marl pit: Ma	------	------	------	------	------	------	------	------	------	------	------
Melvin: Me	3	2	2	1	2	2	3	4	2	1	3
Monongahela: MhB	2	1	1	1	3	4	4	4	1	1	4
Quarries: Qu	------	------	------	------	------	------	------	------	------	------	------
Steep rock land: SrF	------	------	------	------	------	------	------	------	------	------	------
Weikert											
WeC3, WeD3	4	3	2	2	2	4	4	4	3	2	4
WeF	4	4	2	2	2	4	4	4	3	2	4

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction *(8)*. Also important are slope and depth to the water table and to bedrock. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-county movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 6, 7, and 8, that show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples. This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 6, 7, and 8. It also can be used to make other useful maps.

TABLE 6.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils for referring to other series that appear in the first column

Soil series and map symbols	Depth to seasonal high water table	Depth to bed-rock	Kind of bedrock	Depth from surface (repre-sentative profile)	Classification: USDA texture	Classification: Unified	Classification: AASHO
	Feet	*Feet*		*Inches*			
Alluvial land: Ad	[1] 0–3	6	Variable	0–36	Variable silt loam to sandy loam.		
Alluvial land, marl substratum: Am.	[1] 0–1½	1–3	Marl	0–36	Variable silt loam to silty clay loam.		
Ashton: As	4	4	Variable	0–10	Loam	ML, CL	A–4
				10–45	Clay loam	CL, ML	A–4 or A–6
				45–56	Clay loam to fine sandy loam.		
Benevola: BaB, BcC3, BeC, BeD	4	3–4	Irregular hard limestone.	0–8	Silty clay loam	ML or CL	A-4 or A–6
				8–41	Silty clay or clay.	MH or CH	A–7
*Berks: BkB, BlB, BlC, BlD For Weikert part of BlB, BlC, and BlD, see Weikert series.	5	1½–3	Folded, soft, silty shale.	0–10	Shaly silt loam	ML or GM	A–4
				10–25	Very shaly silt loam.	GM, GC, ML	A–2 or A–4
Blairton: BnB	½–1	1½–3½	Folded, clayey shale.	0–7	Silt loam	CL or ML	A–4
				7–20	Silty clay loam	CL or ML	A–6 or A–7
				20–31	Silty clay loam and silty clay.	CL or GC	A–2, A–4 or A–7.
Braddock: BrB, BrC, BrC3, BrD, BrD3, BrE.	4	6–20	Limestone	0–12	Gravelly loam	SM or CL	A2 or A4
				12–44	Clay loam and silt loam.	SC or ML	A6
				44–68	Very gravelly sandy clay loam.	SC, SM, or CL.	A2, A4, or A6.
*Chilhowie: CdB, CdC, CeC3, ChC, ClC3, ClD3. For Opequon part of ChC, ClC3, and ClD3, see Opequon series.	4	1½–2½	Irregular hard limestone.	0–6	Silty clay	CH or MH	A7
				6–23	Clay	MH or CH	A7
Clifton: CmD	4	3½–7	Greenstone and meta basalt.	0–12	Silt loam	ML	A4 or A6
				12–53	Silty clay and silty clay loam.	MH, CH, or CL.	A6 or A7
				53–63	Silt loam	ML or CL	A4 or A6
Dekalb: DcC, DcD, DcE, DcF.	4	2–3½	Massive hard sandstone.	0–9	Channery fine sandy loam.	SM or ML	A2 or A4
				9–23	Channery fine sandy loam.	ML or SM	A2 or A4
				23–39	Channery fine sandy loam.	SM or GM	A2 or A4
Duffield: DgB, DgC, DgC3, DgD3.	4	4–7	Silty limestone with interbedded shales.	0–12	Silt loam	ML	A4
				12–41	Silty clay loam	CL, ML, CH, or MH.	A4 or A7
				41–52	Shaly silty clay loam.	ML, MH, or CH.	A4 or A7

See footnotes at end of table.

significant to engineering

in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions of this table. Absence of data indicates estimate was not made]

Percentage passing sieve— No. 4 (4.7 mm.)	Percentage passing sieve— No. 10 (2.0 mm.)	Percentage passing sieve— No. 200 (0.074 mm.)	Permeability	Reaction	Available moisture capacity	Shrink-swell potential
			Inches per hour	*pH*	*Inches per inch of soil*	
95–100	80–95	60–90	2. 0–6. 3	6. 1–6. 5	0. 15–0. 18	Low.
95–100	80–95	65–95	0. 63–2. 0	6. 1–6. 5	0. 15–0. 21	Low.
				6. 1–6. 5	0. 15–0. 21	Low.
95–100	90–100	80–95	0. 63–2. 0	6. 1–7. 3	0. 15–0. 21	Low to moderate.
85–100	80–100	70–95	0. 63–2. 0	6. 1–7. 3	0. 15–0. 21	Moderate.
50–80	45–65	40–60	6. 3–20. 0	5. 1–6. 5	0. 12–0. 18	Low.
35–70	30–65	25–60	6. 3–20. 0	5. 1–5. 5	0. 08–0. 12	Low.
85–95	75–90	70–80	2. 0–6. 3	5. 1–5. 5	0. 15–0. 18	Low.
60–75	55–65	55–60	0. 2–0. 63	5. 1–5. 5	0. 12–0. 15	Moderate.
35–65	30–60	25–55	0. 2–0. 63	5. 1–5. 5	0. 08–0. 12	Moderate.
80–95	70–95	30–70	2. 0–6. 3	5. 6–7. 3	0. 12–0. 15	Low.
85–95	75–95	40–60	0. 63–2. 0	5. 1–6. 0	0. 12–0. 15	Low.
80–95	50–85	25–60	0. 63–2. 0	5. 1–6. 0	0. 12–0. 15	Low.
85–95	85–95	80–95	0. 2–0. 63	6. 6–7. 3	0. 12–0. 15	High.
70–85	70–85	70–85	0. 06–0. 63	6. 6–7. 8	0. 08–0. 12	High.
70–90	65–85	60–80	2. 0–6. 3	5. 1–6. 0	0. 18–0. 24	Low.
75–95	75–95	70–90	0. 63–2. 0	5. 1–6. 0	0. 12–0. 18	Moderate.
75–95	65–90	60–90	0. 63–2. 0	5. 1–6. 0	0. 15–0. 18	Moderate.
50–85	40–80	30–60	2. 0–6. 3	4. 5–5. 5	0. 12–0. 15	Low.
45–85	40–65	30–55	2. 0–6. 3	4. 5–5. 5	0. 08–0. 12	Low.
40–80	30–60	15–45	2. 0–6. 3	4. 5–5. 5	0. 08–0. 12	Low.
85–100	80–100	70–90	2. 0–6. 3	5. 1–6. 0	0. 18–0. 24	Low.
85–100	80–100	70–80	0. 63–2. 0	5. 1–6. 0	0. 18–0. 24	Moderate.
70–100	65–100	65–90	0. 63–2. 0	5. 6–6. 5	0. 15–0. 18	Low.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Kind of bedrock	Depth from surface (representative profile)	Classification: USDA texture	Classification: Unified	Classification: AASHO
	Feet	*Feet*		*Inches*			
Edgemont: EdD, EdF	4	3–4	Quartzite and sandstone.	0–9	Very stony loam.	SM or ML	A4
				9–25	Very stony sandy clay loam.	SM or ML	A4
				25–50	Very stony sandy loam.	SM or GM	A2 or A4
Frankstown: FbB, FbC, FbC3, FbD, FbD3, FbE3, FcC, FcD, FcD3	4	3–7	Shaly, silty limestone.	0–17	Shaly silt loam	ML	A4
				17–29	Shaly silty clay loam.	ML or CL	A4 or A7
				29–60	Shaly silt loam	CL or MH	A4 or A7
*Frederick Mapped only in an undifferentiated unit with Hagerstown soils	4	3–10	Gray hard limestone.	0–12	Cherty silt loam.	ML or CL	A4 or A6
				12–55	Silty clay and silty clay loam.	CH or MH	A6 or A7
*Hagerstown: HbB, HbC, HcC, HeC3, HfB, HfC, HgB, HgC, HgD, HhC3, HIC3, HID3 For Frederick part of HfB, HfC, HgB, HgC, HgD, HhC3, HIC3, and HID3, see Frederick series.	4	3–10	Gray hard limestone.	0–7	Silt loam	ML or CL	A4 or A6
				7–43	Silty clay and clay.	MH or CH	A7
				43–62	Silty clay	MH or CH	A7
Huntington: Hn, Ho	[2] 3	3–7	Variable	0–42	Silt loam	ML or CL	A4 or A6
				42–52	Silt loam and silty clay loam.	ML or CL	A4 or A6
Laidig: LaC, LaD, LbC, LbD,	3	6–20	Gray acid shale and sandstone.	0–11	Loam	ML, CL	A4
				11–36	Sandy clay loam.	CL	A4, A6
				36–50	Sandy loam	SC, CL, ML	A4 or A6
Landes: Lf	4	4–6	Variable	0–40	Fine sandy loam.	SM or ML	A2 or A4
				40–70	Stratified silt loam and fine sandy loam.	SM or ML	A2 or A4
Lindside: Ln, Lo	[2] 1–2	3–6	Variable	0–23	Silt loam	ML or CL	A4 or A6
				23–45	Silty clay loam	CL or ML	A6 or A7
Marl pit: Ma Variable; no valid estimates can be made.							
Melvin: Me	[1] 0–½	6	Variable	0–16	Silt loam	ML or CL	A4 or A6
				16–48	Silty clay loam	ML or CL	A4, A6, or A7
Monongahela: MhB	1½–2	4–8	Shale and sandstone.	0–13	Silt loam	ML or CL	A4 or A6
				13–26	Silty clay loam	ML or CL	A6
				26–50	Very shaly silty clay loam and silty clay (fragipan).	CL or ML	A4 or A6

See footnotes at end of table.

significant to engineering—Continued

Percentage passing sieve— No 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0 074 mm.)	Permeability	Reaction	Available moisture capacity	Shrink-swell potential
			Inches per hour	*pH*	*Inches per inch of soil*	
75–100	70–100	35–70	2. 0–6. 3	4. 5-5 5	0 12–0 15	Low.
75–100	70–100	35–65	0 63–2. 0	4 5–5 5	0 12–0 18	Low.
55–90	50–90	25–50	2. 0–6. 3	4 5–5 5	0 08–0. 12	Low.
80–95	75–85	60–75	2 0–6 3	5 6–6 5	0 18–0. 24	Low.
80–95	60–85	55–75	0. 63–2 0	5 1–6 0	0 18–0. 24	Low to moderate.
65–90	65–80	55–70	0 63–2 0	4. 5–6. 0	0. 12–0. 15	Moderate.
75–100	70–95	60–90	2. 0–6. 3	5. 1–6. 0	0. 18–0. 24	Low.
85–100	80–95	70–95	0 63–2 0	5. 1–5 5	0 18–0. 24	Moderate to high.
90–100	90–100	75–95	2. 0–6 3	5 6–6. 5	0. 18–0. 24	Low
90–100	90–100	70–95	0 63–2. 0	5 6–6. 5	0 18–0 24	Moderate to high.
90–100	85–100	70–95	0 63–2. 0	5 6–6. 5	0–12–0. 18	Moderate to high.
85–100	80–100	80–100	0 63–2. 0	6 1–7. 3	0. 18–0 24	Low.
75–95	75–95	70–85	0 63–2 0	6 1–7. 3	0. 12–0. 18	Low to moderate.
85–95	80–95	50–65	2 0–6 3	5. 1–5. 5	0 15–0. 18	Low.
80–95	70–95	50–80	0. 63–2. 0	5. 1–5. 5	0. 12–0. 15	Low.
75–90	70–85	40–70	0 2–0 63	5. 1–5. 5	(3)	Low.
95–100	95–100	30–60	2 0–6 3	6 6–7. 8	0. 18–0. 21	Low.
95–100	95–100	30–60	2. 0–6 3	6. 6–7 8	0. 12–0. 18	Low.
90–100	90–100	80–95	0. 63–2 0	5. 1–7 3	0. 18–0. 24	Low.
80–100	80–95	55–85	0 2–2. 0	5 6–7. 3	0. 12–0. 18	Moderate.
----------	----------	----------	----------	----------	----------	----------
95–100	95–100	75–90	0. 63–2. 0	6 1–7. 8	0. 18–0. 24	Low.
95–100	95–100	80–95	0. 20–0. 63	6. 1–7. 8	0. 15–0. 18	Moderate.
90–100	85–100	70–95	0 63–2. 0	5. 1–6. 0	0. 15–0. 18	Low.
90–100	85–100	65–90	0. 63–2. 0	5. 1–5. 5	0. 15–0. 18	Low.
70–100	65–100	50–85	0. 06–0. 63	5. 1–5. 5	0. 12–0. 15	Low.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to bed-rock	Kind of bedrock	Depth from surface (representative profile)	Classification		
					USDA texture	Unified	AASHO
	Feet	*Feet*		*Inches*			
*Opequon: Mapped only in an undifferentiated unit with Chilhowie soils.	3	1–2	Irregular hard limestone.	0–6 6–16	Silty clay Clay	MH or CH MH or CH	A7 A7
Quarries: Qu. Variable; no valid estimates can be made.							
Steep rock land: SrF. Variable; no valid estimates can be made.							
*Weikert: WeC3, WeD3, WeF, BlB, BlC, BlD. For Berks part of BlB, BlC, and BlD, see Berks series.	5	1–1½	Shale	0–6 6–18	Shaly silt loam Very shaly silt loam.	GM or ML GM	A2 or A4 A2

[1] Subject to periodic overflow.
[2] Mapping units Hn and Ln subject to periodic overflow; mapping units Ho and Lo subject to local ponding.
[3] The roots of some plants do not readily penetrate the fragipan layer in Laidig soils.

significant to engineering—Continued

Percentage passing sieve—			Permeability	Reaction	Available moisture capacity	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
			Inches per hour	*pH*	*Inches per inch of soil*	
85–95	85–95	80–95	0. 2–0. 63	6. 6–7. 8	0. 12–0. 15	High.
70–85	70–85	70–85	0 2–0. 63	6. 6–7. 8	0. 08–0. 12	High.
40–80	40–70	30–60	2. 0–6. 3	4. 5–6. 0	0. 12–0. 15	Low.
30–60	30–60	20–35	2. 0–6. 3	4. 5 5. 5	0. 06 0. 12	Low.

TABLE 7.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in referring to other series that appear in the first column of this table. Absence of data indicates interpretation was not made. Because

Series and map symbols	Suitability as a source of —		Soil features affecting—
	Topsoil	Road fill	Highway location
Alluvial land: Ad [2]	Good	Fair to poor: variable; seasonal high water table.	Flooding, seasonal high water table.
Alluvial land, marl substratum. Am [2]	Good to a depth of 1 to 3 feet	Fair to poor: variable; seasonal high water table; marl substratum.	Flooding; seasonal high water table; marl unstable in places.
Ashton: As	Good	Good to fair	Infrequent flooding
Benevola: BaB, BcC3, BeC, BeD	Fair to poor: high clay content.	Poor: erodibility; low shear strength, clayey.	Limestone bedrock outcrops, bedrock at a depth of 40 to 48 inches.
Berks: BkB, BlB, BlC, BlD For Weikert part of BlB, BlC, and BlD, see the Weikert series.	Fair to poor: low available moisture capacity; low fertility.	Fair: limited amount of material.	Shale bedrock at a depth of 1½ to 3 feet; rippable.[3]
Blairton: BnB	Fair to poor: seasonal high water table.	Fair to poor: limited amount of material; susceptible to frost action.	Seasonal high water table, shale bedrock at a depth of 2 to 3½ feet, rippable [3]
Braddock BrB, BrC, BrC3, BrD, BrD3, BrE	Fair to poor: gravelly	Fair to good	Gravel
*Chilhowie CdB, CdC, CeC3, ChC, ClC3, ClD3 For Opequon part of ChC, ClC3, and ClD3, see Opequon series.	Poor: clayey textures and rockiness.	Poor to fair low shear strength, high shrink-swell potential.	Irregular limestone bedrock at a depth of 2 feet.
Clifton: CmD	Fair: stoniness	Fair: high stone content.	Bedrock at a depth of 3½ to 7 feet.
Dekalb: DcC, DcD, DcE, DcF	Fair to poor: channery; moderately low fertility.	Good	Hard massive sandstone bedrock at a depth of 2 to 3½ feet.
Duffield DgB, DgC, DgC3, DgD3	Good	Fair low shear strength.	Shaly limestone bedrock at a depth of 4 to 7 feet.
Edgemont EdD, EdF	Fair to poor: stoniness	Good to fair: stoniness	Sandstone and quartzite bedrock at a depth of 3 to 4 feet.
Frankstown: FbB, FbC, FbC3, FbD, FbD3, FbE3, FcC, FcD, FcD3.	Good to fair: Shale fragments.	Fair: low shear strength.	Shaly limestone bedrock at a depth of 3 to 7 feet
*Frederick Mapped only in an undifferentiated unit with Hagerstown soils.	Fair to good: chert; rockiness.	Fair to poor: low shear strength; rock content.	Hard limestone bedrock at a depth of 3 to 10 feet.

See footnotes at end of table.

interpretations of soils

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for they are variable in characteristics, interpretations were not made for Marl pit (Ma), Quarries (Qu), and Steep rock land (SrF)]

Soil features affecting—Continued				
Pipeline construction	Farm ponds[1]		Agricultural drainage	Irrigation
	Reservoir area	Embankment		
Flooding, seasonal high water table.	Flooding, pervious substratum; individual site investigation required.	Flooding, poor stability; individual site investigation required.	Flooding, variable permeability.	Well drained to poorly drained.
Flooding, seasonal high water table.	Flooding, pervious substratum.	Flooding	Flooding; slow permeability, seasonal high water table.	Well drained to poorly drained
Infrequent flooding	Infrequent flooding; sandy lenses in substratum.	Infrequent flooding	Well drained	Features generally favorable.
Limestone bedrock outcrops, bedrock at a depth of 40 to 48 inches	Solution channels in limestone substratum.	Fair stability, erodibility.	Well drained	Slow intake rate.
Shallow to rippable shale.[3]	Shallow to pervious shale substratum.	Limited amount of material, pervious material.	Well drained	Rapid permeability, low available moisture capacity.
Seasonal high water table.	Pervious substratum in places.	Limited amount of material.	Shallowness, moderately slow permeability, seasonal high water table.	Moderately slow permeability; seasonal high water table.
Features generally favorable	Sandy lenses in places	Features generally favorable.	Well drained	Features generally favorable.
Irregular limestone bedrock at a depth of 2 feet	Solution channels in limestone substratum.	Poor stability	Well drained	Moderately slow permeability; shallow to bedrock.
Bedrock at a depth of 3½ to 7 feet	Stone content high in places.	Stone content high in places; poor stability.	Well drained	Features generally favorable.
Hard massive sandstone bedrock at a depth of 2 to 3½ feet.	Pervious sandstone substratum.	Pervious material, stoniness.	Well drained	Moderate available moisture capacity; rapid permeability.
Shaly limestone bedrock at a depth of 4 to 7 feet.	Solution channels in limestone substratum.	Fair stability	Well drained	Features generally favorable.
Hard bedrock at a depth of 3 to 4 feet.	Pervious sandstone and quartzite bedrock.	Pervious material, stone content.	Well drained	Features generally favorable.
Shaly limestone bedrock at a depth of 3 to 7 feet.	Shallow to pervious bedrock, solution channels.	Fair pervious substratum	Well drained	Features generally favorable.
Hard limestone bedrock at a depth of 3 to 10 feet.	Solution channels in limestone substratum.	Fair stability, high erodibility.	Well drained	Features generally favorable

TABLE 7.—*Engineering interpretations*

Series and map symbols	Suitability as a source of—		Soil features affecting—
	Topsoil	Road fill	Highway location
*Hagerstown: HbB, HbC, HcC, HeC3, HfB, HfC, HgB, HgC, HgD, HhC3, HlC3, HlD3. For Frederick part of HfB, HfC, HgB, HgC, HgD, HhC3, HlC3, and HlD3, see Frederick series.	Good to fair: chert; stoniness.	Fair: low shear strength; rock content high in places.	Hard limestone bedrock at a depth of 3 to 10 feet.
Huntington: Hn, Ho	Good	Fair: low shear strength; flooding.	Flooding
Laidig: LaC, LaD, LbC, LbD	Fair: gravel; stones	Good to fair: stoniness	Stone content high in places; seepage on top of fragipan.
Landes: Lf	Good	Fair: low shear strength; flooding.	Flooding
Lindside: Ln, Lo	Good to fair: seasonal high water table.	Fair: low shear strength; flooding.	Flooding; seasonal high water table.
Melvin: Me	Fair: seasonal high water table.	Poor: low shear strength; seasonal high water table.	Flooding; seasonal high water table.
Monongahela: MhB	Fair to good: seasonal high water table; moderately low fertility.	Fair: fair stability	Seasonal high water table; seepage on top of fragipan; bedrock at a depth of 4 to 8 feet.
*Opequon. Mapped only in an undifferentiated unit with Chilhowie soils.	Fair to poor: clayey textures; rockiness.	Poor: low shear strength; rock content high; high shrink-swell potential; limited quantity of material.	Irregular limestone bedrock at a depth of 1 to 2 feet.
*Weikert: WeC3, WeD3, WeF	Poor to fair: low or very low available moisture capacity; low fertility; shaly.	Good: limited amount of material.	Shale bedrock at a depth of 1 to 1½ feet; rippable[3]

[1] Requirements for shallow-oxidation lagoons for sewage disposal are similar to those for farm ponds.
[2] Features variable; estimates are for general conditions.

of soils—Continued

Soil features affecting—Continued				
Pipeline construction	Farm ponds[1]		Agricultural drainage	Irrigation
	Reservoir area	Embankment		
Hard limestone bedrock at a depth of 3 to 10 feet.	Solution channels in limestone substratum.	Fair stability; stony in places; high erodibility.	Well drained	Features generally favorable.
Flooding	Flooding; sandy lenses in substratum.	Flooding; fair stability	Well drained	Features generally favorable.
Stone content high in places.	Sandy lenses in substratum in places.	Fair stability; stone content high in places.	Well drained	Slow permeability in fragipan.
Flooding	Flooding; sandy lenses in substratum.	Flooding; fair stability	Well drained	Features generally favorable.
Flooding; seasonal high water table.	Flooding; pervious substratum.	Flooding; pervious material.	Moderately well drained; flooding, moderately slow and moderate permeability.	Seasonal high water table.
Seasonal high water table; flooding.	Flooding; sandy lenses in subtratum in places.	Flooding, poor stability; seasonal high water table.	Poorly drained, flooding; moderately slow permeability; lack of outlets.	Poorly drained, moderately slow permeability.
Seasonal high water table; bedrock at a depth of 4 to 8 feet.	Sandy lenses in substratum in places.	Fair stability	Moderately well drained, moderately slow permeability in fragipan; seasonal high water table.	Moderately slow permeability in fragipan; seasonal high water table.
Irregular limestone bedrock at a depth of 1 to 2 feet.	Solution channels in limestone substratum.	Poor stability; limited quantity.	Well drained	Moderately slow permeability, shallow to irregular bedrock.
Shale bedrock at a depth of 1 to 1½ feet [3].	Pervious shale substratum.	Permeable material; limited amount of material.	Well drained	Low or very low avaialble moisture capacity.

[3] Shales assumed rippable to 6 feet.

TABLE 8.—*Engineering*

[Tests performed by West Virginia University, in cooperation with the West Virginia State Road Commission and the Bureau of

Soil name and location	Parent material	Report No. S-64 W. Va.	Depth	Moisture-density [1] Maximum dry density	Moisture-density [1] Optimum moisture
			Inches	*Pounds per cubic foot*	*Percent*
Berks shaly silt loam:[5]					
1 mile north of Leetown on Route 3 (modal).	Residuum from Martinsburg shale.	19-18-1	0-5	97	22
		19-18-2	10-18	110	20
		19-18-3	18-25	106	19
¾ mile west of State Route 32 on Route 32/1 (thinner subsoil range).	Residuum from Harpers shale.	19-10-1	3-9	100	19
		19-10-2	14-23	110	16
		19-10-3	23-31	112	13
2¼ miles south of intersection of Route 32 and Route 340 (very shaly range).	Residuum from gray acid shale. Harpers formation.	19-12-1	1-6	101	22
		19-12-2	10-18	115	16
		19-12-3	22-30	111	15
Braddock gravelly loam:					
1½ miles north of Bloomery on Route 27 (modal).	Alluvial deposits from acid sandstone and shale uplands.	19-13-1	0-8	103	21
		19-13-2	22-32	105	22
		19-13-3	[7]41-47	99	20
1 mile east of Kabletown, ¼ mile west of Shenandoah River (sandy and gravelly range).	Alluvial deposits from acid sandstone and shale uplands.	19- 2-1	0-9	111	15
		19- 2-2	19-34	106	17
		19- 2-3	40-50	98	24
Braddock loam:					
1½ miles east of intersection of Route 25 and 25/1 (loam range).	Alluvial deposits from acid sandstone and shale uplands.	19- 6-1	0-10	115	13
		19- 6-2	20-34	103	22
		19- 6-3	51-66	105	16
Duffield silt loam:					
1 mile east of Rippon on Route 21 (modal).	Residuum from mixed limestone and limy shale.	19- 1-1	0-11	110	16
		19- 1-2	17-28	99	23
		19- 1-3	44-78	90	22
3 miles north of Charles Town on Route 17 (redder, thicker, solum range).	Residuum from mixed pure and shaly limestone	19-11-1	0-11	95	21
		19-11-2	27-38	95	25
		19-11-3	50-79	94	27
1 mile southeast of Charles Town on Route 9 (shaly substratum).[5]	Residuum from limestone and some limy shale.	19-15-1	0-8	100	21
		19-15-2	23-34	93	27
		19-15-3	41-49	92	25
Edgemont very stony loam:					
Keyes Gap at intersection of Route 9 and Route 32 (modal).	Residuum from quartzite and sandstone	19- 9-1	2-9	106	16
		19- 9-2	16-25	123	11
		19- 9-3	29-42	124	11
¼ mile east of Shannondale Road near top of Blue Ridge Mountain (finer textured subsoil range).	Residuum from quartzite and sandstone.	19- 4-1	2-10	97	23
		19- 4-2	10-24	111	15
		19- 4-3	32-40	119	11
Above Route 9, 500 yards south of overlook on Blue Ridge (coarse textured).	Residuum from quartzite and sandstone.	19-14-1	2-9	116	15
		19-14-2	16-25	122	12
		19-14-3	33-41	124	11
Hagerstown silt loam:					
Route 51, 1¾ miles west of Charles Town (modal).	Residuum from high grade Beekmantown limestone.	19-16-1	0-7	100	22
		19-16-2	21-32	85	32
		19-16-3	43-62	94	26
Route 13/2, ¾ mile southwest of Wheatland (redder subsoil, thinner solum range).	Residuum from high grade Beekmantown limestone.	19- 7-1	0-10	105	17
		19- 7-2	17-31	91	29
		19- 7-3	39-53	92	26
Route 1, 1 mile northeast of Leetown (thicker solum range).	Residuum from high grade Beekmantown limestone.	19-17-1	0-7	99	20
		19-17-2	27-41	93	19
		19-17-3	55-68	94	27

See footnotes at end of table.

test data

Public Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*2*)]

Mechanical analysis [2]								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—				Percentage smaller than —						AASHO [3]	Unified [4]
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0 074 mm.)	0. 05 mm.	0. 02 mm.	0. 005 mm.	0. 002 mm.				
81	75	66	53	48	36	17	7	50	10	A–5(5)	ML
95	90	81	65	60	47	28	18	34	8	A–4(6)	ML
100	98	89	77	72	59	38	23	33	5	A–4(8)	ML
100	98	93	81	75	57	28	13	32	7	A–4(8)	ML–CL
95	91	81	68	52	34	30	(6)	26	7	A–4(7)	ML–CL
96	92	78	54	48	32	14	9	23	4	A–4(4)	ML–CL
92	91	86	68	60	42	20	12	46	12	A–7–5(8)	ML
88	84	71	50	42	28	11	6	26	6	A–4(3)	SC
94	93	87	71	67	51	28	15	46	25	A–7–6(13)	CL
82	70	58	49	46	38	23	15	33	9	A–4(3)	SM–SC
87	80	66	47	42	37	28	25	38	16	A–6(4)	SC
93	87	72	55	50	42	37	35	52	22	A–7–5(10)	MH–CH
100	99	90	63	59	47	26	15	24	6	A–4(6)	ML–CL
93	85	73	51	49	43	40	38	56	13	A–7–5(16)	MH
94	89	72	51	48	42	40	38	62	20	A–7–5(8)	MH
--------	100	93	54	47	33	18	13	20	3	A–4(4)	CL
--------	100	94	65	58	47	36	32	40	12	A–6(7)	ML
100	92	68	36	31	24	21	20	39	16	A–6(2)	SC
100	95	88	72	68	54	32	20	26	5	A–4(7)	ML–CL
100	99	90	78	74	65	51	45	59	35	A–7–6(20)	CH
100	95	83	66	60	49	29	18	69	38	A–7–5(17)	CH
96	95	92	85	83	72	46	29	31	6	A–4(8)	ML
96	93	83	69	64	52	32	20	30	3	A–4(7)	ML
100	99	88	69	64	51	32	22	50	17	A–7–5(11)	ML
--------	100	98	86	80	59	23	8	31	7	A–4(8)	ML
--------	100	88	69	63	52	37	27	56	33	A–7–6(17)	CH
--------	--------	--------	97	91	77	50	33	49	20	A–7–6(14)	ML
100	98	83	60	54	40	21	12	31	5	A–4(5)	ML
100	94	74	46	39	24	11	6	23	6	A–4(2)	SC
93	87	62	35	30	17	8	3	22	7	A–2–4(0)	SM–SC
100	99	86	66	60	49	32	18	38	9	A–4(6)	ML
100	96	81	62	57	44	25	16	34	13	A–6(7)	CL
100	94	74	50	46	35	16	8	23	4	A–4(3)	SC
91	87	73	48	40	26	12	7	30	7	A–4(3)	SM
97	90	75	49	42	28	12	7	26	7	A–4(3)	SM–SC
81	76	60	35	18	16	6	4	21	6	A–2–4(0)	SM–SC
100	98	95	87	82	72	46	28	35	6	A–4(8)	ML
100	99	87	71	67	53	35	23	82	56	A–7–6(19)	CH
--------	100	98	88	82	70	50	38	51	19	A–7–5(14)	MH
100	98	94	80	78	66	36	26	28	5	A–4(8)	ML–CL
100	99	88	71	65	53	37	25	65	35	A–7–5(19)	CH
--------	100	98	97	84	68	52	46	58	31	A–7–5(20)	CH
100	98	90	77	72	60	39	26	34	10	A–4(8)	ML
--------	100	88	71	66	54	36	25	68	35	A–7–5(19)	MH–CH
100	94	84	70	65	53	33	21	52	21	A–7–5(14)	MH–CH

TABLE 8.—*Engineering*

Soil name and location	Parent material	Report No. S–64 W. Va.	Depth	Moisture-density [1] Maximum dry density	Moisture-density [1] Optimum moisture
			Inches	*Pounds per cubic foot*	*Percent*
Laidig very stony loam:					
Shannondale development near intersection of Moonshine and White Mule Lanes (modal).	Colluvium from quartzite and sandstone uplands.	19– 3–1	3–11	112	16
		19– 3–2	16–29	110	17
		19– 3–3	36–48	114	14
Route 32, 1.5 miles south of intersection with Route 340 (coarser subsoil range).	Colluvium from quartzite and sandstone uplands.	19– 8–1	4–13	120	12
		19– 8–2	18–34	119	14
		19– 8–3	34–50	124	14
Laidig gravelly loam:					
Route 9/5, ¾ mile south of intersection with Route 9 (nonstony range, heavy B22t).[6]	Colluvium from quartzite and sandstone uplands.	19– 5–1	3–11	108	15
		19– 5–2	24–38	102	18
		19– 5–3	44–60	104	19

[1] Based on the Moisture-density Relations of Soils Using 5.5-lb. Rammer and 12-in. Drop AASHO Designation T99, Method A and C.

[2] Mechanical analyses according to the AASHO Designation T88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses data used in this table are not suitable for use in naming textural classes for soil.

The engineering interpretations reported here do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Estimates generally are made to a depth of about 5 feet, and interpretations do not apply to greater depths. Also, engineers should not apply specific values to the estimates for bearing capacity and traffic-supporting capacity given in this survey. Investigation at each site is needed because many delineated areas of a given soil mapping unit contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for engineering. Even in these situations, however, the soil map is useful in planning more detailed field investigations and for indicating the kinds of problems to be expected.

Some of the terms used in this soil survey have special meaning to soil scientists not known to all engineers. Many of the terms commonly used in soil science are defined in the Glossary at the back of this survey.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system *(15)* used by SCS engineers, Department of Defense, and others, and the AASHO system *(2)* adopted by the American Association of State Highway Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML-CL.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A-7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-7, A-7-5, and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 8; the estimated classification, without group index numbers, is given in table 6 for all soils mapped in the survey areas.

Soil properties significant to engineering

Several estimated soil properties significant in engineering are given in table 6. These estimates are made for representative soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties.

test data—Continued

Mechanical analysis [2]								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—				Percentage smaller than—						AASHO [3]	Unified [4]
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0. 05 mm.	0. 02 mm.	0. 005 mm.	0. 002 mm.				
100	95	78	62	60	46	25	14	27	6	A–4(5)	ML–CL
100	96	86	65	59	44	30	22	40	18	A–6(9)	CL
100	97	80	60	56	48	33	24	34	12	A–6(6)	ML–CL
100	95	78	54	46	31	15	8	26	7	A–4(4)	ML–CL
100	96	80	56	51	40	26	18	28	8	A–4(4)	CL
100	93	76	52	46	31	11	5	25	3	A–4(3)	ML
100	97	89	63	53	32	10	5	21	4	A 4(6)	ML–CL
100	99	96	85	82	76	65	58	54	20	A–7–5(15)	MH
100	98	96	66	56	38	21	15	31	14	A–6(8)	CL

[3] Based on AASHO Designation M 145–49.

[4] Based on the Unified Soil Classification System, Technical Memorandum No. 3–357, Volume 1, Corps of Engineers, (*15*). SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given a borderline classification. Examples of a borderline classification obtained by this use is ML–CL.

[5] Mechanical analyses procedure breaks down most of the coarse fragments to sizes which pass the No. 10 sieve.

[6] Data not available.

[7] Estimated 20 to 30 percent coarse fragments discarded prior to analysis.

The names of the soil series are listed in alphabetic order and the map symbols of each soil are given. Depth to seasonal high water table and also depth to bedrock are listed. Soils that have a high water table are limited in their use for highways and for other structures. Depth to bedrock can affect the cost of excavating and the design of foundations.

In the column headed "Depth from Surface," the depth, in inches, is given for the major distinctive layers of the soil profile. This profile is the one described as representative for each series in the section "Description of the Soils," and the layers indicated are those typical of the layers in all the soils of the series.

Soil texture is described in table 6 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that are less than 2 millimeters in diameter. Also given in table 6 is the Unified and AASHO classification.

The estimated percentage passing sieves is the normal range of soil particles passing the respective screen sizes.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those characteristics observed in the field, particularly texture and structure. Ratings are expressed in inches per hour. The following classes are used: very slow—less than 0.06 inch per hour; slow—0.06 to 0.20 inch per hour; moderately slow—0.2 to 0.63 inch per hour; moderate—0.63 to 2.0 inch per hour; moderately rapid—2.0 to 6.3 inches per hour; and rapid—6.30 to 20.00 inches or more per hour.

Reaction is the degree of acidity or alkalinity of a soil expressed in pH value. The pH value and terms used to describe soil reaction are explained in the glossary.

Available moisture capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Engineering interpretations of soils

Table 7 rates the soils in Jefferson County according to their suitability as a source of materials for topsoil and road fill. It also gives features that affect suitability of the soils for the construction and location of highways, for the construction and maintenance of pipelines, for water retention structures, for agricultural drainage, and for irrigation systems.

Topsoil is a term used to designate a fertile layer of soil material, ordinarily rich in organic matter, used as a topdressing for lawns, gardens, roadbanks, and the like. The ratings indicate suitability for such use. For ratings other than good, major soil limitations are given. Soil factors, such as natural fertility, erodibility, thickness, depth to water table, and presence of stones, affect suitability.

Road fill is material used in embankments for roads.

The ratings indicate performance of soil material moved from borrow areas for this purpose. In general, a sandy material containing adequate binder is best for road fill, and plastic clay or organic material is poorest. Texture, compaction characteristics, stability, erodibility, and depth to water table are among the factors considered in making ratings.

Highway location is influenced by features of the undisturbed soil that affect construction and maintenance of highways. Soil features important to highway location, such as depth to bedrock, depth to water table, and the hazard of flooding, are shown for the soils.

Construction and maintenance of pipelines are affected by depth to bedrock, slip hazards, erodibility, and depth to water table. Corrosivity of uncoated steel is influenced by a low pH value, a water table, and organic matter.

Farm pond reservoir areas are affected mainly by loss of water through seepage, and the soil features influence such seepage. Soil features, such as texture, slope, presence of stones, depth to and permeability of the substratum, and the hazard of flooding, are important to this use.

Farm pond embankments serve as dams. The soil features, of both subsoil and substratum, are those important to the use of soils for constructing embankments. Stability of the soil material, impermeability, compaction characteristics, high water table, erodibility, and presence of stones are important to this use of soil material.

Agricultural drainage is needed to drain excess water from soils. Moderately well drained soils, such as Lindside soils, generally need only spot drainage, but poorly drained soils, such as Melvin soils, need more complete drainage to be suitable for row crops.

Irrigation is most applicable on deep, well-drained, nearly level soils that have moderate permeability and high available moisture capacity. Soil factors affecting irrigation are permeability of soil layers below the surface layer, need for drainage, and available moisture capacity. Availability of a water supply is not considered.

Waterways are generally established in natural drainageways. They are normally kept grassed to safely control runoff. Water table, slope, stones, erodibility, and depth to bedrock should be considered when waterways are planned.

There are no reliable sources of sand and gravel in the county. Extensive deposits of limestone suitable for crushing for road aggregates and other construction uses are in the Great Limestone Valley.

It is important to note that the limestone underlying the Great Limestone Valley is strongly folded, and many strata dip at a steep angle or are nearly vertical. As a result, there are long narrow outcrops, or ledges, of limestone that generally are in a southwest to northeast direction. Although the limestone crops out in many places, the soils near these outcrops are as deep as 3 to 10 feet in places. Thus, if pipelines, roads, and other engineering works are laid out parallel to the ledges, the amount of blasting and rock removal is materially reduced.

Test data

Table 8 contains engineering test data for some of the major soil series in Jefferson County. The tests were made to help evaluate the soils for engineering purposes. The soils were tested in accordance with standard procedures of the American Association of State Highway Officials (AASHO).

The engineering soil classifications in this table are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by the combined sieve and hydrometer methods. The percentage of clay obtained by the hydrometer method should not be used in naming the textural classes of soils.

Moisture density, the relation of moisture content and the density to which a soil material is compacted, is given in table 8. If a soil is compacted at a successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture. The highest dry density obtained in the compaction test is termed maximum dry density. Moisture-optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The liquid limit and plasticity index indicate the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Use of Soils for Town and Country Planning

Town and country planning is becoming more extensive and important in Jefferson County. Sound planning is vital to the success of individual enterprises. It is, perhaps, even more important in community or countywide planning. Facts in this soil survey and interpretations of the soils in the county provide information useful in such planning and establishment.

In table 9 the soils are rated as having slight, moderate, or severe limitations for specified uses. A rating of *slight* means that soil properties are generally favorable and limitations are so minor they can be overcome easily. A rating of *moderate* means that a limitation can be overcome by planning, by design, and by good management. A rating of *severe* means that costly soil reclamation, special design, intense maintenance, or a combination of these is needed.

The information given is for the dominant soil shown on the soil map. Inclusions of small areas of different kinds of soil are present because of the scale of mapping and the natural variation of soils. The rating of limitations in table 9 does not eliminate the need for careful onsite investigation.

Town and country planning ratings given in table 9 and soil properties affecting them are discussed in the following paragraphs.

Sewage Effluent Disposal Fields.—The main limiting features of these soils for septic tank filter fields are shallowness to bedrock, slow permeability, steepness of slope, a high water table, and flooding. The soils having slight limitations are generally well suited to filter fields. The moderately rated soils are less well suited and larger filter fields are more commonly needed than on soils that have slight limitations. Soils that have severe ratings are generally unsuitable, and should be thoroughly investigated before planning a septic disposal field on them.

Impoundments and Sewage Lagoons.—Impoundments generally are more than one half acre in size and can be used for swimming, fishing, ice skating, and other related forms of recreation. Sewage lagoons are shallow ponds built to dispose of sewage through oxidation. They can be used in some areas where septic tanks and sewage systems are not feasible or practical. The soil restrictions and limitations for these uses are about the same as on soils used for farm ponds. Among the properties to consider are slope, soil depth, permeability, and the hazard of flooding. Soils that are sandy, that are underlain by sand and gravel, or that are shallow to bedrock have severe limitations.

Buildings and Homesites.—Slope, depth to water table, slips, the hazard of flooding, and depth to bedrock are soil properties affecting locations of buildings and houses. Buildings considered are three stories or less and have basements. Sewage disposal is not considered. Depth to bedrock is a less severe limitation for buildings that do not have basements than for those that do.

Campsites.—Tent and trailer sites should be large enough for level pads, picnic tables, fireplaces, parking space, and to provide privacy. Limitations generally are less severe for tents than for trailer sites. Properties to consider in rating soils for campsites are slope, depth to bedrock, natural soil drainage, and soil texture.

Access Roads.—These roads carry light and medium traffic to recreational areas and to buildings and homesites. Soil features affecting the degree of limitation are soil depth, depth to water table, stoniness, slip and flood hazards, and slope. Limitations generally are somewhat less restrictive for slope and depth to bedrock than for streets and parking lots. Soil requirements and limitations are similar to those for highways (see tables 6 and 7 in the section "Engineering Use of Soils"). Table 6 shows the depth to seasonal high water table, depth to bedrock, and the shrink-swell potential of each soil in the county. In table 7 is shown the suitability of each soil for road fill and the limitations that affect highway location.

Streets and Parking Lots.—Soil requirements and limitations for streets and parking lots are similar to those for highways (see tables 6 and 7 in the section "Engineering Uses of the Soils"). Table 6 shows the depth to seasonal high water table, depth to bedrock, and the shrink-swell potential for each soil in the county. In table 7 is shown the suitability of each soil for road fill, the limitations that affect highway location, and their susceptibility to frost action. Slope and the hazard of flooding are other factors affecting the location of streets and parking lots.

Athletic Fields.—These generally are small, nearly level areas used for football, baseball, and other athletic field events. Because the areas must be nearly level, considerable grading and land shaping generally are needed. A clayey, gravelly, or stony surface makes an unsuitable playing area. Depth to bedrock, slope, depth to water table, and the hazard of flooding are other properties that affect the suitability of soils for athletic fields.

Extensive Play Areas.—These are fairly large areas used for picnicking and other recreational activities. These areas are essentially left in their natural state. Slope, texture, high water table, and the hazard of flooding are properties that affect use of extensive play areas. Limitations are less severe for these uses than for more intensive uses, such as athletic fields.

Lawns and Landscaping.—If the necessary additions of lime and fertilizer are made, soil properties that determine whether or not a good lawn can be easily established and maintained are soil depth, texture, slope, droughtiness, depth to water table, and stoniness. These properties also affect maintenance of shrubs and ornamentals used in landscaping.

Formation, Morphology, and Classification of Soils

This section consists of three main parts. In the first part the factors of soil formation are discussed as they relate to the formation of soils in Jefferson County. The second part discusses the morphology of soils. In the third part each soil series represented in the county is placed in its respective family, subgroup, and order of the current system for classifying soils, and also is placed in its respective great group of the classification system used in 1938 and later revised.

For further information about the current system for classifying soils, refer to "Soil Classification, a Comprehensive System" *(13)*.

Factors of Soil Formation

Soils are formed through the interaction of five major factors. These factors are climate, plant and animal life, parent material, relief, and time. The relative influence of each factor generally varies from place to place. Local variations in soils are due to differences in kind of parent materials, topography, and drainage. In places one factor may dominate the formation of a soil and determine most of its properties.

Climate.—Climate affects the formation of soils through its influence on the rate of weathering of rocks and decomposition of minerals and organic matter. It also affects biological activity in the soils and the leaching and movement of weathered materials.

The climate of Jefferson County is of a humid, continental type marked by seasonal temperature changes. It has an annual precipitation of about 40 inches and a mean annual air temperature of 55° F. The rainfall is fairly uniform throughout the year. Summer temperatures average about 73° F. and winter temperatures about 28° F. Temperature differences are small between the valley floor and the top of the Blue Ridge.

TABLE 9.—*Estimated degree and kinds of*

[Marl pit (Ma), Quarries (Qu), and Steep

Series and map symbols	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Buildings and homesites 3 stories or less	Campsites
				Tents
Alluvial land.[1] Ad	Severe: flooding; seasonal high water table.	Severe: flooding	Severe: flooding, seasonal high water table.	Severe. flooding, seasonal high water table.
Alluvial land, marl substratum.[1] Am	Severe: flooding; seasonal high water table.	Severe: flooding	Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table.
Ashton: As	Moderate: infrequent flooding.	Moderate: infrequent flooding; sandy lenses in places.	Severe: infrequent flooding.	Moderate: infrequent flooding.
Benevola:				
BaB	Moderate: bedrock at a depth of 40 to 48 inches, slopes; occasional rock outcrops [2]	Severe: bedrock at a depth of 40 to 48 inches; rock outcrops, solution channels.	Moderate: bedrock at a depth of 40 to 48 inches.	Moderate: moderately fine textured surface layer.
BcC3	Moderate: bedrock at a depth of 40 to 48 inches, slopes; occasional rock outcrops [2]	Severe. bedrock at a depth of 40 to 48 inches; slopes; solution channels.	Moderate: bedrock at a depth of 40 to 48 inches; slopes.	Severe: fine-textured surface layer
BeC, BeD	Severe: rock outcrops.[2]	Severe: bedrock at a depth of 40 to 48 inches; slopes; rock outcrops; solution channels.	Severe: bedrock at a depth of 40 to 48 inches, rock outcrops.	Severe. fine-textured surface layer.
Berks: BkB	Severe:[2] rippable; bedrock at a depth of 20 to 34 inches.	Severe: pervious substratum.	Moderate. rippable; bedrock at a depth of 20 to 34 inches.	Slight
Berks-Weikert:				
BlB	Severe: rippable; bedrock at a depth of 10 to 34 inches [2]	Severe. pervious substratum.	Moderate: rippable; bedrock at a depth of 10 to 34 inches.	Slight
BlC	Severe: rippable; bedrock at a depth of 10 to 34 inches.[2]	Severe: pervious substratum; slopes.	Moderate: rippable; bedrock at a depth of 10 to 34 inches.	Moderate. slopes
BlD	Severe: rippable; bedrock at a depth of 10 to 34 inches; slopes.[2]	Severe. pervious substratum; slopes.	Moderate rippable, bedrock at a depth of 10 to 34 inches	Moderate: slopes
Blairton: BnB	Severe. seasonal high water table; moderately slow permeability.	Moderate: bedrock at a depth of 20 to 40 inches; slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.

See footnotes at end of table.

limitation for town and country planning

rock land (SrF) are not rated in this table]

Campsites—Con. Trailers	Access roads	Streets and parking lots	Athletic fields	Extensive play areas	Lawns and landscaping
Severe: flooding, seasonal high water table.	Severe flooding, seasonal high water table.	Severe. flooding, seasonal high water table.	Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table	Severe. flooding, seasonal high water table
Severe. flooding; seasonal high water table.	Severe: flooding, seasonal high water table.	Severe: flooding; seasonal high water table	Severe: flooding; seasonal high water table.	Severe: flooding, seasonal high water table.	Severe: flooding; seasonal high water table.
Moderate infrequent flooding	Moderate: infrequent flooding.	Moderate: infrequent flooding.	Slight	Slight	Slight.
Moderate bedrock at a depth of 40 to 48 inches.	Slight	Moderate slopes	Severe. bedrock at a depth of 40 to 48 inches, slopes.	Moderate moderately fine-textured surface layer.	Moderate. moderately fine textured surface layer.
Severe. fine textured surface layer.	Moderate. slopes	Severe. slopes	Severe bedrock at a depth of 40 to 48 inches, slopes, fine-textured surface layer	Severe. fine-textured surface layer.	Severe fine-textured surface layer; very erodible
Severe: fine-textured surface layer, slopes; rock outcrops.	Severe rock outcrops.	Severe. bedrock at a depth of 40 to 48 inches, rock outcrops.	Severe: fine-textured surface layer, bedrock at a depth of 40 to 48 inches, slopes.	Severe. fine-textured surface layer.	Severe fine-textured surface layer, very erodible, rock outcrops.
Moderate slopes	Slight	Moderate: rippable; bedrock at a depth of 20 to 34 inches, slopes.	Severe: rippable, bedrock at a depth of 20 to 34 inches	Slight	Moderate. rippable, bedrock at a depth of 20 to 34 inches.
Moderate: slopes	Moderate: rippable, bedrock at a depth of 10 to 34 inches	Severe: rippable, bedrock at a depth of 10 to 34 inches.	Severe: rippable; bedrock at a depth of 10 to 34 inches	Slight	Moderate. rippable, bedrock at a depth of 10 to 34 inches.
Severe: slopes	Moderate. rippable; bedrock at a depth of 10 to 34 inches, slopes.	Severe: rippable, bedrock at a depth of 10 to 34 inches.	Severe rippable, bedrock at a depth of 10 to 34 inches, slopes.	Moderate: slopes	Moderate: rippable, bedrock at a depth of 10 to 34 inches, slopes.
Severe: slopes	Moderate. rippable, bedrock at a depth of 10 to 34 inches; slopes	Severe. rippable; bedrock at a depth of 10 to 34 inches, slopes.	Severe: rippable; bedrock at a depth of 10 to 34 inches; slopes.	Severe: slopes	Severe: slopes.
Severe: seasonal high water table.	Moderate to severe: seasonal high water table; bedrock at a depth of 20 to 40 inches.	Moderate to severe: seasonal high water table; bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; bedrock at a depth of 20 to 40 inches.	Moderate: seasonal high water table.	Moderate. seasonal high water table.

TABLE 9.—*Estimated degree and kinds of limita*

Series and map symbols	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Building and homesites 3 stories or less	Campsites
				Tents
Braddock:				
BrB	Slight	Moderate: slopes; sandy lenses in substratum in places.	Slight	Slight
BrC, BrC3	Moderate: slopes	Severe: slopes; sandy lenses in substratum in places.	Moderate: slopes	Moderate: slopes
BrD, BrD3	Severe: slopes	Severe: slopes; sandy lenses in substratum in places.	Moderate: slopes	Severe: slopes
BrE	Severe: slopes	Severe: slopes; sandy lenses in substratum in places.	Severe: slopes	Severe: slopes
Chilhowie: CdB, CdC, CeC3	Severe: slow permeability; high shrink-swell potential; bedrock at a depth of 20 to 36 inches [2]	Severe: bedrock at a depth of 20 to 36 inches; solution channels.	Severe: high shrink-swell potential; bedrock at a depth of 20 to 36 inches; fine-textured surface layer.	Severe: bedrock at a depth of 20 to 36 inches; fine-textured surface layer.
Chilhowie and Opequon: ChC, ClC3, ClD3.	Severe: moderately slow permeability; bedrock at a depth of 12 to 36 inches; rock outcrops; high shrink-swell potential.	Severe: bedrock at a depth of 12 to 36 inches; rock outcrops; solution channels.	Severe: bedrock at a depth of 12 to 36 inches; fine-textured surface layer; high shrink-swell potential.	Severe: bedrock at a depth of 12 to 36 inches; fine-textured surface layer.
Clifton: CmD	Moderate to severe: bedrock at a depth of 40 to 80 inches; slopes.	Moderate: bedrock at a depth of 40 to 80 inches.	Moderate: bedrock at a depth of 40 to 80 inches.	Moderate to severe: bedrock at a depth of 40 to 80 inches; slopes.
Dekalb:				
DcC	Severe: bedrock at a depth of 24 to 40 inches [2]	Severe: bedrock at a depth of 24 to 40 inches, slopes.	Severe: bedrock at a depth of 24 to 40 inches.	Severe: bedrock at a depth of 24 to 40 inches.
DcD, DcE, DcF	Severe: bedrock at a depth of 24 to 40 inches; slopes.	Severe: bedrock at a depth of 24 to 40 inches; slopes.	Severe: bedrock at a depth of 24 to 40 inches.	Severe: bedrock at a depth of 24 to 40 inches; slopes.
Duffield:				
DgB	Slight [2]	Moderate: bedrock at a depth of 48 to 84 inches; solution channels.	Slight	Slight
DgC, DgC3	Moderate: slopes [2]	Severe: bedrock at a depth of 48 to 84 inches; slopes.	Moderate: bedrock at a depth of 48 to 84 inches; slopes.	Moderate: slopes
DgD3	Severe: slopes [2]	Severe: bedrock at a depth of 48 to 84 inches; slopes.	Moderate: bedrock at a depth of 48 to 84 inches; slopes.	Severe: slopes

See footnotes at end of table.

tion for town and country planning—Continued

Campsites—Con. Trailers	Access roads	Streets and parking lots	Athletic fields	Extensive play areas	Lawns and landscaping
Moderate: slopes	Slight	Moderate: slopes	Moderate: slopes, gravel.	Slight	Slight.
Severe: slopes	Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Severe: bedrock at a depth of 20 to 36 inches, fine-textured surface layer	Severe: bedrock at a depth of 20 to 36 inches.	Severe: bedrock at a depth of 20 to 36 inches.	Severe: bedrock at a depth of 20 to 36 inches; fine-textured surface layer.	Severe: bedrock at a depth of 20 to 36 inches; fine-textured surface layer.	Severe: bedrock at a depth of 20 to 36 inches; fine-textured surface layer.
Severe: bedrock at a depth of 12 to 36 inches, fine-textured surface layer.	Severe: bedrock at a depth of 12 to 36 inches.	Severe: bedrock at a depth of 12 to 36 inches; rock outcrops.	Severe: bedrock at a depth of 12 to 36 inches; fine-textured surface layer; rock outcrops	Severe: bedrock at a depth of 12 to 36 inches; fine-textured surface layer	Severe: bedrock at a depth of 12 to 36 inches, fine-textured surface layer.
Moderate to severe: bedrock at a depth of 40 to 80 inches, stones; slopes.	Severe: slopes	Severe: slopes	Severe: bedrock at a depth of 40 to 80 inches, slopes.	Moderate to severe: slopes.	Moderate to severe: slopes; stones.
Severe: bedrock at a depth of 24 to 40 inches, slopes.	Moderate: bedrock at a depth of 24 to 40 inches; slopes.	Severe: slopes	Severe: bedrock at a depth of 24 to 40 inches.	Moderate: slopes	Moderate: bedrock at a depth of 24 to 40 inches; slopes.
Severe: bedrock at a depth of 24 to 40 inches; slopes.	Severe: bedrock at a depth of 24 to 40 inches; slopes.	Severe: bedrock at a depth of 24 to 40 inches; slopes.	Severe: bedrock at a depth of 24 to 40 inches; slopes.	Severe: slopes	Severe: slopes.
Moderate: slopes	Slight	Moderate: slopes	Moderate: slopes	Slight	Slight.
Severe: slopes	Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.

TABLE 9.—*Estimated degree and kinds of limita*

Series and map symbols	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Building and homesites 3 stories or less	Campsites
				Tents
Edgemont				
EdD	Severe: slopes	Severe: bedrock at a depth of 42 to 60 inches; slopes.	Moderate: bedrock at a depth of 42 to 60 inches; slopes.	Severe slopes
EdF	Severe slopes	Severe bedrock at a depth of 42 to 60 inches; slopes.	Severe bedrock at a depth of 42 to 60 inches, slopes	Severe slopes
Frankstown:				
FbB	Slight [2]	Moderate. slopes, solution channels.	Slight	Slight
FbC, FbC3	Moderate slopes [2]	Severe: bedrock at a depth of 48 to 84 inches; slopes, solution channels	Moderate bedrock at a depth of 48 to 84 inches	Moderate: slopes
FbD	Severe: slopes [2]	Severe bedrock at a depth of 48 to 84 inches; slopes, solution channels.	Moderate bedrock at a depth of 48 to 84 inches, slopes.	Severe: slopes
FdD3, FdE3	Severe slopes [2]	Severe slopes, solution channels.	Severe bedrock at a depth of 48 to 84 inches	Severe: slopes
FcC	Severe: rock outcrops [2]	Severe bedrock at a depth of 48 to 84 inches, slopes; rock outcrops; solution channels	Severe bedrock at a depth of 48 to 84 inches; rock outcrops.	Severe rock outcrops
FcD, FcD3	Severe: slopes, rock outcrops.	Severe bedrock at a depth of 48 to 84 inches, slopes; rock outcrops; solution channels.	Severe: bedrock at a depth of 48 to 84 inches; rock outcrops.	Severe: slopes, rock outcrops.
Hagerstown				
HbB	Slight [2]	Moderate: slopes, occasional rock outcrops, solution channels.	Slight	Slight
HbC, HeC3	Moderate: slopes [2]	Severe: slopes, occasional rock outcrops; solution channels	Moderate: slopes	Moderate: slopes
HcC	Severe: rock outcrops.[2]	Severe: rock outcrops, solution channels.	Severe: rock outcrops.	Severe: rock outcrops.

See footnotes at end of table.

tion for town and country planning—Continued

Campsites—Con.. Trailers	Access roads	Streets and parking lots	Athletic fields	Extensive play areas	Lawns and landscaping
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes, stones	Severe: slopes	Severe: slopes, stones.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes; stones.	Severe: slopes	Severe: slopes; stones.
Moderate: slopes.	Slight	Moderate: slopes	Moderate: slopes	Slight	Slight.
Severe: slopes	Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Severe: rock outcrops.	Severe: rock outcrops.	Severe: rock outcrops.	Severe: rock outcrops.	Moderate: rock outcrops.	Severe: rock outcrops.
Severe: slopes; rock outcrops.	Severe: rock outcrops.	Severe: slopes, rock outcrops.	Severe: slopes; rock outcrops.	Severe: slopes	Severe: rock outcrops.
Moderate: slopes	Slight	Moderate: slopes	Moderate: slopes	Slight	Slight.
Severe: slopes	Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes
Severe: rock outcrops.	Severe: rock outcrops.	Severe: rock outcrops.	Severe: rock outcrops.	Severe: rock outcrops.	Severe: rock outcrops.

TABLE 9.—*Estimated degree and kinds of limita*

Series and map symbols	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Building and homesites 3 stories or less	Campsites: Tents
Hagerstown and Frederick:				
HfB	Slight [2]	Moderate: slopes; rock outcrops, solution channels.	Slight	Slight
HfC, HhC3	Moderate: slopes; few rock outcrops [2]	Severe: bedrock at a depth of 48 to 120 inches, slopes; few rock outcrops.	Moderate: bedrock at a depth of 48 to 120 inches; slopes.	Moderate: slopes
HgB	Severe: rock outcrops [2]	Severe: bedrock at a depth of 48 to 120 inches; rock outcrops; solution channels.	Severe: bedrock at a depth of 48 to 120 inches; rock outcrops	Moderate to severe: rock outcrops.
HgC, HgD, HlC3, HlD3	Severe: rock outcrops.[2]	Severe: bedrock at a depth of 48 to 120 inches; rock outcrops; solution channels	Severe. bedrock at a depth of 48 to 120 inches: rock outcrops.	Severe. rock outcrops.
Huntington:				
Hn	Severe: flooding	Severe: flooding; sandy lenses in substratum.	Severe: flooding	Severe: flooding
Ho	Moderate. local ponding; solution channels.	Moderate to severe: solution channels.	Moderate. local ponding.	Moderate: local ponding.
Laidig				
LaC	Moderate. slopes, moderately slow permeability in fragipan.	Severe slopes	Moderate: slopes	Moderate: slopes
LaD	Severe slopes	Severe: slopes	Moderate: slopes	Severe slopes
LbC	Moderate: slopes, stones	Severe: slopes, stones	Moderate slopes, stones	Moderate slopes, stones
LbD	Severe: slopes	Severe: slopes	Moderate slopes; stones	Severe: slopes
Landes: Lf	Severe: flooding	Severe. flooding	Severe flooding	Severe: flooding
Lindside:				
Ln	Severe: flooding; seasonal high water table.	Severe: flooding; sandy layers.	Severe flooding; seasonal high water table.	Severe: flooding; seasonal high water table.
Lo	Severe: flooding, seasonal high water table; moderately slow permeability.	Moderate to severe flooding; solution channels	Severe flooding; seasonal high water table	Severe: flooding; seasonal high water table.
Melvin: Me	Severe. flooding; seasonal high water table, moderately slow permeability.	Severe: flooding	Severe: flooding; seasonal high water table.	Severe: flooding, seasonal high water table.
Monongahela: MhB	Severe: seasonal high water table; slow permeability in fragipan.	Moderate: slopes	Moderate: seasonal high water table	Moderate: seasonal high water table

See footnotes at end of table.

tion for town and country planning—Continued

Campsites—Con.: Trailers	Access roads	Streets and parking lots	Athletic fields	Extensive play areas	Lawns and landscaping
Moderate. slopes, few rock outcrops.	Slight	Moderate: bedrock at a depth of 48 to 120 inches, slopes; few rock outcrops.	Moderate: bedrock at a depth of 48 to 120 inches; slopes, few rock outcrops.	Slight	Slight.
Severe slopes	Moderate: slopes	Severe: bedrock at a depth of 48 to 120 inches; slopes	Severe: bedrock at a depth of 48 to 120 inches, slopes.	Moderate: slopes	Moderate: slopes.
Severe: rock outcrops.	Severe: rock outcrops.	Severe: bedrock at a depth of 48 to 120 inches; rock outcrops.	Severe: bedrock at a depth of 48 to 120 inches; rock outcrops.	Moderate to severe: rock outcrops.	Severe: rock outcrops
Severe: rock outcrops.	Severe: rock outcrops.	Severe: bedrock at a depth of 48 to 120 inches, rock outcrops.	Severe: bedrock at a depth of 48 to 120 inches: rock outcrops.	Severe: rock outcrops.	Severe rock outcrops
Severe. flooding	Moderate to severe: flooding.	Moderate to severe. flooding.	Moderate: flooding	Moderate: flooding	Slight to moderate: flooding.
Moderate: local ponding.	Slight	Moderate: local ponding.	Slight	Slight	Slight.
Severe: slopes	Moderate: slopes	Severe: slopes	Severe: slopes, gravel.	Moderate: slopes	Moderate: slopes; gravel.
Severe slopes	Severe: slopes	Severe slopes	Severe slopes	Severe. slopes	Severe. slopes
Severe. slopes, stones.	Moderate: slopes	Severe. slopes	Severe: slopes	Moderate: slopes, stones.	Severe stones.
Severe. slopes	Severe slopes; stones.	Severe: slopes; stones.	Severe: slopes	Severe slopes	Severe: slopes; stones.
Severe: flooding	Slight	Severe: flooding	Slight to moderate: flooding.	Moderate: flooding	Slight to moderate: flooding.
Severe: flooding, seasonal high water table.	Severe: flooding; seasonal high water table.	Severe: flooding, seasonal high water table.	Severe: flooding, seasonal high water table.	Moderate. flooding seasonal high water table.	Moderate to severe: flooding, seasonal high water table.
Severe: flooding, seasonal high water table.	Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table.	Moderate: flooding; seasonal high water table.	Moderate: flooding; seasonal high water table.	Slight to moderate: flooding; seasonal high water table.
Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table.
Moderate. slopes.	Moderate: seasonal high water table.	Moderate: slopes, seasonal high water table.	Moderate: slopes; seasonal high water table.	Slight to moderate: seasonal high water table.	Slight.

TABLE 9.—*Estimated degree and kinds of limita*

Series and map symbols	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Building and homesites 3 stories or less	Campsites
				Tents
Weikert:				
WeC3	Severe: rippable; bedrock at a depth of 10 to 20 inches [2]	Severe: pervious substratum; rippable; bedrock at a depth of 10 to 20 inches; slopes.	Moderate: rippable; bedrock at a depth of 10 to 20 inches; slopes	Moderate: rippable; bedrock at a depth of 10 to 20 inches; slopes.
WeD3	Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes.[2]	Severe: pervious substratum; rippable; bedrock at a depth of 10 to 20 inches; slopes.	Moderate: rippable; bedrock at a depth of 10 to 20 inches; slopes.	Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes.
WeF	Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes [2]	Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes.	Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes.	Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes

[1] Variable texture, drainage, and flood hazard; onsite investigations needed.

Climate does not vary enough in Jefferson County to account for all the differences among soils. The climate tends to develop strongly weathered, leached, moderately fertile soils. This leaching has prevented the accumulation of free calcium carbonate in many of the soils. Calcium is present, however, in most of the underlying rocks. More detailed climate data is given in the section "General Nature of the County."

Plant and animal life.—All living organisms are important to soil formation. These include vegetation, animals, bacteria, and fungi. The vegetation is generally responsible for the amount of organic matter and the color of the surface layer and influences the amount of nutrients. Animal life, such as earthworms, cicada, and burrowing animals, helps keep the soils open and porous. Bacteria and fungi, through decomposition of vegetation, cause many beneficial changes in the soil, such as the release and leaching of elements, aggregation, aeration, and better soil-moisture relationship.

Parent materials.—Parent material is the unconsolidated mass from which the soils are formed. In large part it determines the mineral and chemical composition of the soil.

In Jefferson County, soils formed most extensively in residual materials from limestone on gentle slopes in the Great Limestone Valley. East of the Shenandoah River, soils are strongly sloping to very steep and formed in residual material from acid sandstone, shale, and quartzite. A few soils also formed in colluvial materials, stream terraces, and recent stream alluvium.

Residual parent materials are from a variety of rocks in Jefferson County (*5*). Folded, acid, gray shales and siltstone of Ordovician age are along the western edge of the Great Limestone Valley. Shallow to moderately deep, medium-textured soils that have a high content of rock fragments, such as Berks and Weikert soils, are dominant. The Beekmantown and Conococheague limestone of Ordovician and Cambrian age underlies much of the Great Limestone Valley. Many solution caverns provide underground drainage. Medium-textured to fine-textured soils, such as Duffield, Frankstown, and Hagerstown soils, characterize the area. Antietam and Weverton sandstone of Cambrian age underlies much of the steeper areas east of the Shenandoah River. Medium-textured and coarse-textured soils, such as Dekalb and Edgemont soils, are extensive.

Colluvial materials are on toe slopes below uplands underlain by acid sandstone, quartzite, and shale. These materials are medium textured to moderately coarse textured and commonly contain gravel or stones throughout. They receive underground and surface water from higher slopes. Laidig soils are on these materials.

Stream terrace deposits are minor in extent. These acid materials commonly have gravel throughout and are along the Potomac and Shenandoah Rivers and Opequon Creek. Braddock and Monongahela soils are on these areas.

Recent alluvium from limestone uplands is along the rivers, streams, and intermittent drainageways. This material is medium textured and slightly acid to mildly alkaline. Huntington and Huntington, local alluvium; Landes, Lindside, and Melvin soils; and Alluvial land, marl substratum, are on these materials. Small areas of medium-textured to coarse-textured, mostly acid and gravelly materials are along the streams below the sandstone and shale uplands. Alluvial land is on these areas.

Relief.—The shape of the land, and the slope and position of the soils in relation to the water table have strongly affected the formation of soils in Jefferson County. Soils that formed on steep areas where runoff is excessive, and where movement of soil material by creep is appreciable, have weakly developed profiles. Gently sloping soils in the Great Limestone Valley show few characteristics associated with wetness. This generally can be attributed

tion for town and country planning—Continued

Campsites—Con. Trailers	Access roads	Streets and parking lots	Athletic fields	Extensive play areas	Lawns and landscaping
Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes.	Moderate: rippable; bedrock at a depth of 10 to to 20 inches; slopes.	Severe: rippable; bedrock at a depth of 10 to 20 inches, slopes.	Severe: rippable, bedrock at a depth of 10 to 20 inches; slopes.	Severe. rippable; bedrock at a depth of 10 to 20 inches.	Severe: rippable; bedrock at a depth of 10 to 20 inches.
Severe rippable, bedrock at a depth of 10 to 20 inches, slopes.	Severe. slopes	Severe: rippable, bedrock at a depth of 10 to 20 inches; slopes.	Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes	Severe: rippable; bedrock at a depth of 10 to 20 inches; slopes.	Severe rippable; bedrock at a depth of 10 to 20 inches, slopes.
Severe: rippable, bedrock at a depth of 10 to 20 inches; slopes.	Severe: slopes	Severe: rippable, bedrock at a depth of 10 to 20 inches; slopes.	Severe: rippable, bedrock at a depth of 10 to 20 inches, slopes.	Severe: slopes	Severe. slopes

[2] Underground water may be contaminated by seepage of waste liquid through rock crevices or solution channels.

to moderate permeability and extensive subsurface drainage through solution caverns. In nearly level areas, along the drainageways where the water table is at or near the surface for long periods, the soils show much evidence of wetness. They have a surface layer and a strongly mottled or grayish subsoil. Thus the length, steepness, and configuration of the slopes influence the characteristics of soil that is formed from place to place. Local differences in soils are largely the result of differences in parent material and topography.

Time.—The formation of soils requires time for changes to take place in the parent material. Generally a long time is needed when measured in years. The soils in Jefferson County range from young soils on stream bottoms to old soils on gently sloping uplands. Soils formed on bottoms subject to flooding receive new sediment in places each time flooding occurs. These soils have weak soil structure and weak color differences between horizons. An example is the Landes soils. In some areas that are steep, soil material is removed by creep, washing, or mixing by solifluction before it has time to develop a distinct profile. Dekalb soils are common on these steep areas.

In smooth upland areas the parent material is relatively stable, and its removal is slow. Therefore, the soil-forming factors have a long time to act on the same material. As a result, mature soils that have distinct genetic horizons, such as Hagerstown soils, have formed.

Morphology of Soils

This subsection briefly discusses the process involved for horizon development.

Processes of soil differentiation

There are several processes involved in the formation of soil horizons in the soils of Jefferson County. These include the accumulation of organic matter, the leaching of soluble salts, the formation and translocation of clay minerals, and the reduction and transfer of iron. These processes are continually taking place, generally at the same time throughout the profile. These processes are measured in thousands of years.

The accumulation of organic matter takes place when plants decompose. This process darkens the surface layer and helps to form the A1 horizon. Organic matter, once it has been lost, takes a long time to replace. The surface layer in tilled soils in Jefferson County averages about 1.0 to 1.5 percent content of organic matter. The thin A1 horizon in wooded areas commonly has 4.5 to 6.0 percent content of organic matter.

In order for soils to have distinct horizons, it is believed that some of the calcium carbonate and other soluble salts must be leached before the translocation of clay minerals. Many factors affect this leaching, such as major vegetation, the kinds of salts originally present, the depth to which the soil solution percolates, and the texture and structure of the profile.

The most important process of soil-horizon formation in Jefferson County is the formation and translocation of silicate clay minerals. The amount of clay minerals in a profile is inherent to the parent material, but amounts of clay vary from one horizon to another. Clay minerals are generally eluviated from the A horizon and illuviated in the B horizon as clay films on ped faces and in pores and root channels. In some soils, an A2 horizon formed by a considerable amount of eluviation of clay minerals to the B horizon. The A2 horizons are light colored and have a platy structure in places. The Duffield soils are an example of clay-mineral translocation.

The reduction and transfer of iron is associated mainly with wetter, more poorly drained soils. This process is called gleying. Moderately well drained to somewhat poorly drained soils have yellowish-brown and reddish-

brown mottles, indicating the segregation of iron. Poorly drained to very poorly drained soils, such as Melvin soils, have a subsoil and underlying materials that are grayish, indicating reduction and transfer of iron.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 *(3)* and later revised *(11)*. The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. It is under continual study *(10, 13)*. Therefore, readers interested in developments of the current system should search the latest literature available. The soil series of Jefferson County are placed in some categories of the current system in table 10.

ORDER. Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. The exceptions to this are the Entisols,

TABLE 10.—*Soil series classified according to current system of classification [1] and the 1938 system with its later revisions*

Series	Current classification			1938 classification with later revisions
	Family	Subgroup	Order	Great soil group
Ashton [2]	Fine-silty, mixed, mesic	Mollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Alluvial soils.
Benevola	Fine-illitic, mesic	Mollic Hapludalfs	Alfisols	Reddish-Brown Lateritic soils.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides intergrading to Lithosols.
Blairton [3]	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic intergrading to Gray-Brown Podzolic soils.
Braddock [4]	Clayey, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Chilhowie [5]	Very fine, mixed, mesic	Mollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Lithosols.
Clifton [6]	Clayey, mixed, mesic	Humic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Dekalb	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides soils
Duffield	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Red-Yellow Podzolic soils.
Edgemont	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Frankstown	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Frederick [7]	Clayey, kaolinitic, mesic	Typic Paleudults	Ultisols	Red-Yellow Podzolic soils.
Hagerstown	Fine, mixed, mesic	Typic Hapludalfs	Alfisols	Reddish-Brown Lateritic soils.
Huntington	Fine-silty, mixed, mesic	Fluventic Hapludolls	Mollisols	Alluvial soils.
Laidig	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils.
Landes	Coarse-loamy, mixed, mesic	Fluventic Hapludolls	Mollisols	Alluvial soils.
Lindside	Fine-silty, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols	Alluvial soils.
Melvin	Fine-silty, mixed, nonacid, mesic	Typic Fluvaquents	Entisols	Alluvial soils.
Monongahela	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils.
Opequon	Clayey, mixed, mesic	Lithic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Lithosols.
Weikert	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols	Lithosols intergrading to Sols Bruns Acides.

[1] Placement of some series in the current system of classification, particularly in families and subgroups, may change as more precise information becomes available.
[2] Ashton series in this county is slightly coarser textured in B horizons than the defined range for Ashton series
[3] Blairton series in this county is slightly finer textured in B horizons and has shallower depth to bedrock than the defined range for Blairton series.
[4] Braddock series in this county is slightly coarser textured in B horizons than the defined range for Braddock series.
[5] Chilhowie series in this county has slightly thinner, dark-colored surface horizons than the defined range for Chilhowie series.
[6] Clifton series in this county has slightly lighter colored surface horizons than the defined range for Clifton series.
[7] Frederick series in this county has slightly thinner argillic horizons than the defined range for Frederick series.

Histosols, and, to some extent, Inceptisols, which occur in many different climates. Five soil orders are represented in Jefferson County. They are Entisols, Inceptisols, Mollisols, Alfisols, and Ultisols.

Entisols are mineral soils that have little or no evidence of development of horizons as a result of the soil forming factors. The Melvin soils are the Entisols in the county.

Inceptisols are mineral soils that have genetic horizons starting to develop but do not have horizons of clay accumulation. The Berks, Dekalb, Lindside, and Weikert soils are the Inceptisols in the county.

Mollisols are mineral soils that have a thick, dark-colored surface layer that has high base saturation. They may or may not have horizons of clay accumulation. The Huntington and Landes soils are the Mollisols in the county.

Alfisols are mineral soils that have a B horizon of clay accumulation and a high base saturation. The Ashton, Benevola, Chilhowie, Duffield, Hagerstown, and Opequon soils are the Alfisols in the county.

Ultisols are mineral soils that have a B horizon of clay accumulation and a relatively low base saturation. The Ultisols in the county are Blairton, Braddock, Clifton, Edgemont, Frankstown, Frederick, Laidig, and Monongahela soils.

SUBORDER. Each order is divided into suborders, primarily on the basis of those soil characteristics that seem to produce classes that have the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect the presence or absence of waterlogging or soil differences resulting from climate or vegetation.

GREAT GROUPS. Soil suborders are separated into great groups on the basis of uniformity in the kind and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that have pans that interfere with growth of roots or movement of water. The features used are the self-mulching properties of clay, the soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium and potassium), and the like.

SUBGROUP. Great groups are divided into subgroups, one representing the central, or typic, segment of the group and others called intergrades that have properties of the group and also have one or more properties of another group, suborder, or order. Subgroups are also made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order.

FAMILY. Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name.

The nomenclature for the classes in each of the four highest categories is, for the most part, connotative. The formative elements come chiefly from the classical languages. Many of the roots are familiar and help us to visualize the soil. For example, the Dekalb series is classed as a Typic Dystrochrept. From the formative elements one can visualize that the Dekalb soils must be typical (typic), infertile (Dystr), must have characteristics associated with a light-colored (ochr, from the Greek *ochros*, for pale) surface layer, and young (*ept*, from the Latin *inceptum*, for beginning) in terms of degree of development.

The names are distinctive for the classes in each category, so that a name itself indicates the category to which a given class belongs. The names are designed so that each subgroup by its name is placed with the great group, suborder, and order with which it is identified. For example, the name Typic Hapludults indicates a class in the subgroups. Furthermore, from the name, one can identify the great group (Hapludults) and suborder (udults) and the order (Ultisols).

General Nature of the County

This section discusses settlement of the county, physiography, climate, and other subjects of general interest.

Settlement, Population, and Transportation

Jefferson County was formed in 1801, but West Virginia did not become a State until 1863. It is the easternmost county in the State and has an area of 135,040 acres. The first settlement was about 1719 when farmers from Pennsylvania settled in the vicinity of Shepherdstown. The land for Charles Town, the county seat, was donated by Charles Washington, brother of the first president. The town was named after him.

The county has maintained its agricultural character, and the population has remained relatively stable, though it has several small towns and industries.

In 1970, Charles Town had a population of 3,023; Ranson, 2,189; Shepherdstown, 1,688; Bolivar, 943; and Harpers Ferry, 423. Limestone is quarried extensively and supplied to steel companies and allied industries. The Minnesota Mining and Manufacturing Company has a plant near Middleway. Two racetracks at Charles Town operate for a major part of the year. Many homes, towns, and villages are points of historic interest.

The county is served by a network of rural roads and main highways and by two railroads.

Physiography, Relief, and Drainage

Jefferson County is within two Geologic provinces. The eastern one-fifth of the county is part of the Blue Ridge Province and the western four-fifths is part of the Great Limestone Valley and is in Ridges and Valleys Province.

The Blue Ridge and its foothills east of the Shenandoah River are underlain by acid, shale, sandstone, and quartzite. At two places on top of the mountain are small outcrops of igneous rocks. They are mostly schist and are the only exposures in the state. Soils are mostly steep, and the elevation rises to about 1,800 feet above sea level. The drainage flows into the Shenandoah River. Most of the area is wooded. Many summer homes are scattered throughout the region.

The Great Limestone Valley is smoothly rolling and is underlain by folded limestone (fig. 11) and a small

Figure 11.—**Folded limestone of the Great Limestone Valley.**

amount of acid shale. Elevation generally is between 450 and 600 feet above sea level. Many small streams form a trellis-like drainage pattern, but much of the drainage is through solution channels in the underlying limestone.

Harpers Ferry, the lowest point in the State, is 247 feet above sea level. Here the Shenandoah and Potomac Rivers join and leave the county (fig. 12). Almost all of the Great Limestone Valley is in general farms and orchards. Woodlots are small and scattered.

Water Supply

Much of the water in the county is supplied from wells. In the limestone strata, the depth to and the volume of water are variable, and contamination is possible from underground streams. Strongly flowing springs are scattered throughout the area. In the limestone area obtaining water for livestock is often difficult, although several small streams and small ponds are used. In the Blue Ridge area, most of the water is from wells. Opequon Creek and a few of the smaller streams are used for a limited amount of irrigation. The Potomac and Shenandoah Rivers are sources of water.

Climate [5]

The county's continental type of climate, characterized by large seasonal temperature contrasts, is tempered slightly by the nearby marine influence that occasionally prevails when the atmospheric circulation is from the east or southeast. The county is in a transitional zone between the more maritime climate of the Atlantic Slope and the drier areas in the lee of the Allegheny Mountains. Jefferson County's precipitation deficit, because of its somewhat sheltered position from eastward-moving storm systems, is made up by Atlantic coastal storms. Annual precipitation is the highest of any Eastern Panhandle area, although it is still slightly below the State average of 43 inches. The month of August averages the highest

[5] By ROBERT O. WEEDFALL, climotologist for West Virginia, National Weather Service, U.S. Department of Commerce.

Figure 12.—**Near the confluence of the Potomac and Shenandoah Rivers at historic Harpers Ferry. Steep rock land is on the right.**

amount of precipitation, and the month of February the least. The length of the growing season and the rainfall during the growing season is generally adequate for orchard fruits, as well as for pasture, small grain, and corn raised on livestock and dairy farms. The years 1962 through 1966, and some earlier years, have had periods of drought that have seriously affected farm production. A dry spell in July or August occurs on an average of once every four or five years and is more damaging to crops than the more usual, later-occurring fall dry spells. Table 11 gives temperature and precipitation data for Jefferson County.

The typical weather pattern in summer consists of clear, cool mornings and evenings, partly cloudy and warm afternoons, and a late afternoon thunderstorm every four or five days. The temperature reaches 90° F. or higher 30 days each year and, on the average, reaches 100° F. every other year. Low humidity prevails at such times, so discomfort is alleviated. Humidity occasionally is oppressive, however, when maritime air penetrates inland from coastal areas. Except during these periods, nights during the summer months are generally cool. An average of 35 to 40 thunderstorms occur each year, and the most frequent months of occurrence are June, July, and August. Hail is a major threat to orchards, and varying amounts can fall during any thunderstorm. Violent local winds sometimes accompany the heavier, more intense thunderstorms. Light winds prevail, however, most of the time. From data recorded at Kearneysville, windspeeds are below 5 miles per hour more than 50 percent of the time; in July the percentage is 78 and in April, the windiest month, the percentage drops to 44.

Frosts late in spring cause a certain amount of damage to fruit trees. Nighttime radiational cooling under calm conditions and in local "frost hollows" injures buds on the lowest limbs of the trees in places. A temperature of 32° F. or lower has occurred as late as May 24 and as early as September 11. Table 12 gives data on probabilities of the last freezing temperatures in spring and the first in fall.

Average dates of frost occurrence for Kearneysville, which were determined by the University Experimental Farm in Kearneysville, are applicable to all parts of Jefferson County, with the exception of local "frost-hollow" areas where some deviations are expected *(6)*. The data for Kearneysville, which is at an elevation of 550 feet, was obtained over a period of 35 years. The average length of the frost-free period is 164 days.

Winters are generally moderate. Cold waves occur two or three times per year but seldom last longer than a few

TABLE 11.—*Temperature and precipitation data*

Month	Temperature: Average daily maximum [1]	Temperature: Average daily minimum [1]	Two years in 10 will have at least 4 days with—Maximum temperature equal to or higher than [1]—	Two years in 10 will have at least 4 days with—Minimum temperature equal to or lower than [1]—	Precipitation: Average monthly total [2]	One year in 10 will have—Less than [2]—	One year in 10 will have—More than [2]—	Average number of days with snow cover of 1.0 inch or more [1]	Average depth of snow on days with snow cover [1]
	° F.	° F.	° F.	° F.	Inches	Inches	Inches	Number	Inches
January	42	22	55	6	2. 63	1. 0	4. 6	12	5. 7
February	45	24	63	8	2. 33	1. 0	3. 9	12	7. 3
March	56	32	75	15	3. 37	1 7	5. 4	4	4. 0
April	67	42	87	28	3. 40	1. 4	5. 8	0	0
May	78	53	92	37	3. 77	1. 7	6. 4	0	0
June	85	60	95	50	3. 54	1. 8	5. 7	0	0
July	89	64	96	53	4. 12	1. 4	7. 5	0	0
August	88	63	95	52	4. 27	1. 6	8. 1	0	0
September	81	56	93	43	3. 27	1. 0	6. 0	0	0
October	71	45	85	32	3. 54	0. 8	7. 2	0	0
November	59	37	72	25	2. 79	0. 9	5. 2	0	0
December	44	25	59	9	2. 86	0. 8	4. 8	8	4. 4
Year	67. 1	43. 4			39. 89	31. 50	50. 50	36	

[1] Data from records at National Monument Station, Harpers Ferry, elevation 220 feet, for period 1958–66.
[2] Data from records at Post Office Station, Harpers Ferry, elevation 405 feet, for period 1931–60.

days. There are frequent alternations of fair and stormy weather and frequent freezes and thaws. An annual extreme minimum temperature of -11° F. is expected once every 10 years and a -15° F. once every 25 years. The average seasonal snowfall is between 20 and 25 inches. Total snowfall amounts vary greatly from season to season, however, and have ranged from more than 50 inches to less than 6 inches.

Cloud cover is least in summer and fall and greatest in winter. The months of September, October, and November normally have many dry, sunny periods that delay the sprouting and early growth of fall-seeded grain and hay crops in places.

Evaporation records suggest that the average annual evaporation from a standard 4-foot pan amounts to about 50 inches and, from May through October, about 36 inches. Evaporation from ponds and reservoirs makes up about 75 percent of these amounts.

Farming

The statistics given in this section are based mainly on the 1964 U.S. Census of Agriculture. Farming is important in the economy of Jefferson County. Of the 135,040 acres in the county, 102,335 acres, or 75.8 percent, was in farms. The average size of farms was 208 acres.

Land use has been stable in Jefferson County, although there has been a trend in the last decade for people from

TABLE 12.—*Probabilities of last freezing temperatures in spring and first in fall*

Probability	Dates for given probability and temperature: 16° or lower	20° or lower	24° or lower	28° or lower	32° or lower
Spring:					
1 year in 10 later than	March 22	March 31	April 10	April 30	May 12
1 year in 4 later than	March 14	March 23	April 2	April 23	May 5
1 year in 3 later than	March 10	March 20	March 30	April 20	May 2
2 years in 3 later than	February 27	March 8	March 19	April 9	April 22
3 years in 4 later than	February 23	March 5	March 15	April 6	April 19
9 years in 10 later than	February 15	February 25	March 7	March 29	April 12
Fall:					
1 year in 10 earlier than	November 16	November 10	October 26	October 7	September 25
1 year in 4 earlier than	November 25	November 16	November 2	October 15	October 1
1 year in 3 earlier than	November 29	November 18	November 4	October 19	October 4
2 years in 3 earlier than	December 13	November 27	November 13	October 30	October 12
3 years in 4 earlier than	December 16	November 29	November 16	November 2	October 15
9 years in 10 earlier than	December 26	December 5	November 22	November 10	October 21

nearby cities to purchase small farms to be used as vacation homes. Numerous summer homes have been built in the vicinity of Blue Ridge and along the Potomac and Shenandoah Rivers.

Of the acreage in cropland in 1964, 43,936 acres were in harvested crops, 13,539 acres were used for pasture, and 5,983 acres were in other uses. Of the acreage in woodland, 3,536 acres were in pastured woodland and 4,095 acres were in nonpastured woodland. Other pasture that was in neither cropland nor woodland made up 28,058 acres.

Of the acreage in principal crops in 1964, 12,272 acres were in corn; 3,774 acres, in wheat; 1,989 acres, in oats; and 1,574 acres, in barley. Of the acreage in hay crops, 8,518 acres were in alfalfa and alfalfa mixtures and 6,778 acres were in clover, timothy, and mixtures of these. Of the trees of bearing age in orchards in the county, 178,636 were apple trees, 23,119 were peach trees, and 13,332 were cherry trees.

Of the livestock raised in the county, there were 10,832 cattle and calves, 6,883 milk cows, and 7,310 swine.

Literature Cited

(1) Allan, Phillip F., Garland, Lloyd E., and Dugan, R. Franklin.
1963. Rating northeastern soils for their suitability for wildlife habitat. N Am. Wildlife and Natural Res. Trans, 247-261.

(2) American Association of State Highway Officials.
1961. Standard specifications for highway materials and methods of sampling and testing. Ed. 8, 2 v, illus., Washington, D C

(3) Baldwin, Mark, Kellogg, Charles E., and Thorp, James.
1938. Soil classification. U.S. Dept. of Agr. Ybk. 978-1001, illus.

(4) Ferguson, Rolland H.
1964. The timber resources of West Virginia. U.S. Forest Service Resource Bul. NE-2, 123, illus.

(5) Grimsley, G. P.
1916. Jefferson, Berkeley, Morgan counties, West Virginia geological survey. County Report, 644 pp., illus.

(6) Havens, A. V. and McGuire, J. K.
1961 Spring and fall low-temperature probabilities N. J. Agr. Expt. Sta. Bul. 801 New Brunswick, N.J. 32 pp., illus

(7) McCarthy, E. F.
1933. Yellow poplar characteristics, growth, and management. U.S. Dept. Agr. Tech. Bul. 356, 58 pp

(8) Portland Cement Association.
1962 PCA soil primer. 52 pp., illus, Chicago, Ill.

(9) Schnur, G. Luther.
1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S. Dept. Agr. Tech. Bul 560, 88 pp., illus.

(10) Simonson, Roy W.
1962. Soil classification in the United States. Sci 137: 1027-1034.

(11) Thorp, James and Smith, Guy D.
1949 Higher categories of soil classification: order, suborder, and great soil groups. Soil Sci. 67: 117-126.

(12) United States Department of Agriculture.
1951. Soil survey manual. U.S. Dept. of Agr. Handbook No. 18. 503 pp., illus.

(13) ———
1960. Soil classification, a comprehensive system, 7th. approximation. 265 pp., illus. [Supplements issued in March 1967 and September 1968]

(14) ———
1961 Yield of Virginia pine. U S. Forest Service Southeastern Forest Expt. Sta. paper No. 124, 11 pp.

(15) United States Department of Defense.
1968. Unified soil classification system for roads, airfields, embankments, and foundations. MIL-STD. 619-B, 30 pp., illus.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams

Aspect. (forestry). The direction toward which a slope faces. Synonym: Exposure.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain", of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage

Clay. As a soil separate, the mineral soil particles less than 0 002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are -

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressures between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable

Plastic—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft—When dry, breaks into powder or individual grains under very slight pressure

Cemented—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. Nearly level land, consisting of stream sediment, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the lower horizons, as a result of waterlogging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray The soil-forming processes leading to the development of a gleyed soil.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage; V-shaped gullies result if the material is more difficulty to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon—The mineral horizon at the surface or just below an O horizon This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides)

B horizon. The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these Combined A and B horizons are usually called the solum, or true soil If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C

R layer—Consolidated rock beneath the soil The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.

Leached layer. A layer from which the soluble materials have been dissolved and washed away by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 4 millimeters to 15 millimeters (about 0 2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0 6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour", soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5 0	Mildly alkaline	7.4 to 7 8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock Residual material is not soil but is frequently the material in which a soil has formed.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2 0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate, from gravel; sandstone, from sand; shale, from clay; and limestone, from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sands have consolidated into sandstone.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Shale. A sedimentary rock formed by the hardening of clay deposits.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0 002 millimeter) to the lower limit of very fine sand (0 05 millimeter) Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetation barriers to wind and water erosion

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular* Structureless soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans)

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace Land above the lowlands along rivers.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Accessibility Statement

This document is not accessible by screen-reader software. The U.S. Department of Agriculture is committed to making its electronic and information technologies accessible to individuals with disabilities by meeting or exceeding the requirements of Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended in 1998. Section 508 is a federal law that requires agencies to provide individuals with disabilities equal access to electronic information and data comparable to those who do not have disabilities, unless an undue burden would be imposed on the agency. The Section 508 standards are the technical requirements and criteria that are used to measure conformance within this law. More information on Section 508 and the technical standards can be found at www.section508.gov.

If you require assistance or wish to report an issue related to the accessibility of any content on this website, please email Section508@oc.usda.gov. If applicable, please include the web address or URL and the specific problems you have encountered. You may also contact a representative from the USDA Section 508 Coordination Team.

Nondiscrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

(1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;

(2) fax: (202) 690-7442; or

(3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
WEST VIRGINIA
AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

JEFFERSON COUNTY, WEST VIRGINIA

Scale 1:126 720

SOIL ASSOCIATIONS*

SOILS OF THE GREAT LIMESTONE VALLEY

1 Berks-Weikert association: Moderately deep and shallow, medium-textured, dominantly gently sloping to strongly sloping soils formed in material weathered from acid shale; on uplands

2 Chilhowie-Opequon association: Moderately deep and shallow, fine-textured, dominantly gently sloping to strongly sloping soils formed in material weathered from limestone; on uplands

3 Hagerstown-Frederick-Huntington, local alluvium association: Deep, medium-textured and moderately fine textured, dominantly nearly level to moderately steep soils formed in material weathered from limestone; on uplands and along drainageways

4 Duffield-Frankstown association: Deep, medium-textured, dominantly nearly level to strongly sloping soils formed in material weathered from limestone and limy shale; on uplands

5 Benevola-Frankstown-Braddock association: Deep, fine-textured to medium-textured, dominantly nearly level to moderately steep soils formed in material weathered from limestone and limy shale on uplands and from sandstone and acid shale on terraces

6 Braddock-Landes-Ashton association: Deep, medium-textured and moderately coarse textured, dominantly nearly level to strongly sloping soils formed in material weathered from sandstone and acid shale on terraces and from limestone on flood plains

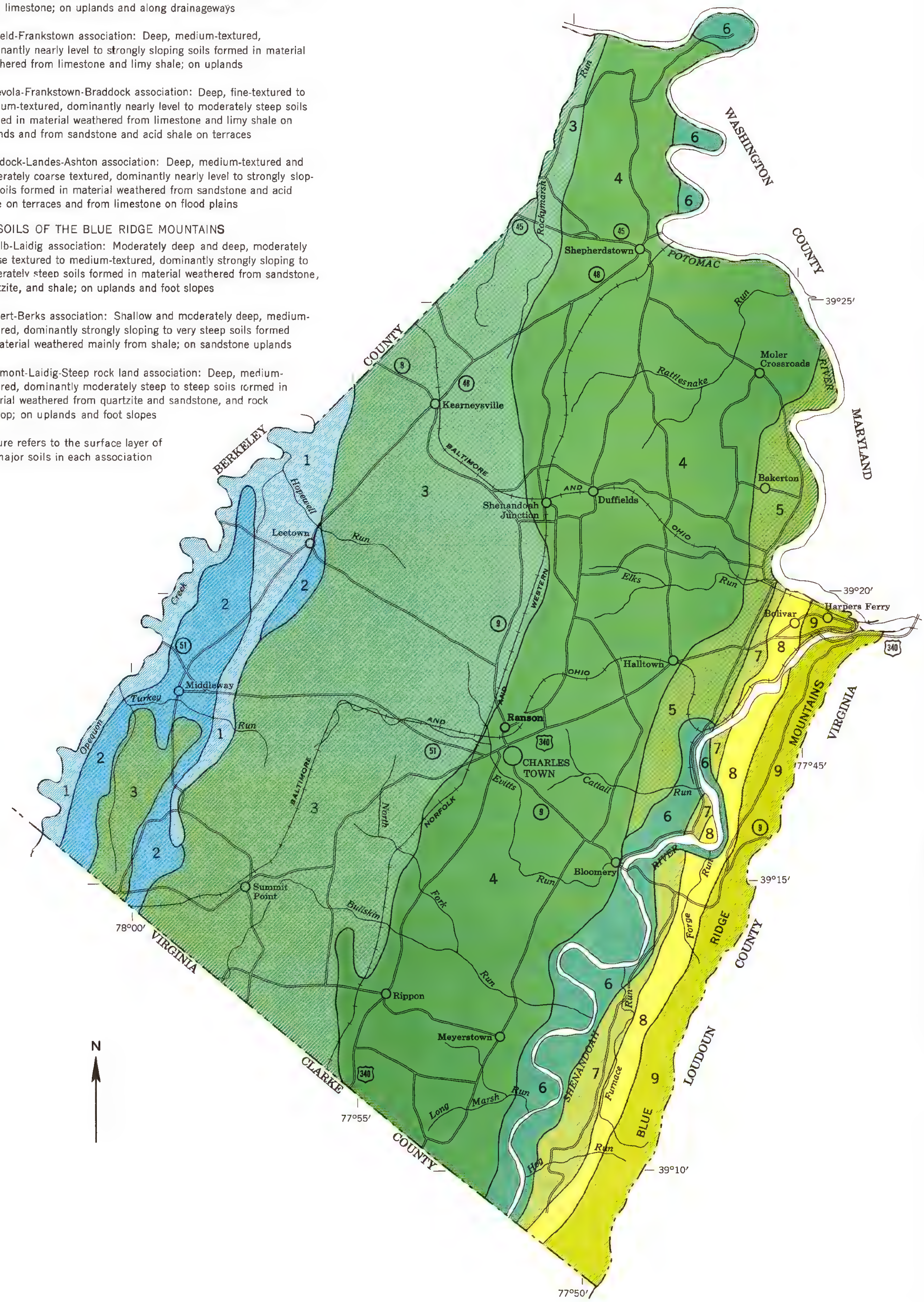
SOILS OF THE BLUE RIDGE MOUNTAINS

7 Dekalb-Laidig association: Moderately deep and deep, moderately coarse textured to medium-textured, dominantly strongly sloping to moderately steep soils formed in material weathered from sandstone, quartzite, and shale; on uplands and foot slopes

8 Weikert-Berks association: Shallow and moderately deep, medium-textured, dominantly strongly sloping to very steep soils formed in material weathered mainly from shale; on sandstone uplands

9 Edgemont-Laidig-Steep rock land association: Deep, medium-textured, dominantly moderately steep to steep soils formed in material weathered from quartzite and sandstone, and rock outcrop; on uplands and foot slopes

* Texture refers to the surface layer of the major soils in each association

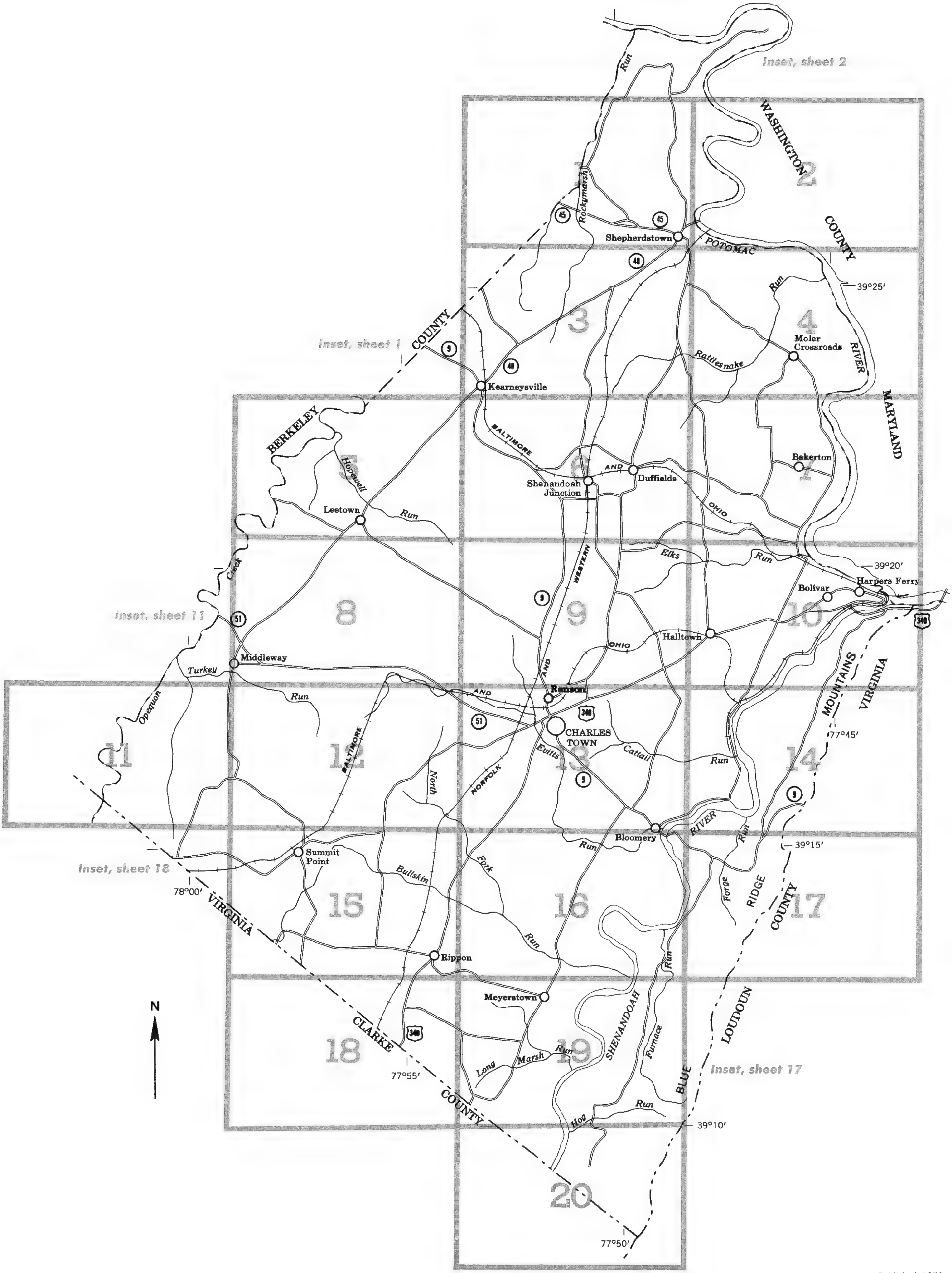


Published 1972

INDEX TO MAP SHEETS
JEFFERSON COUNTY, WEST VIRGINIA

1 0 1 2 3 4 Miles

Scale 1:126720



Published 1972

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. The suitability of the soils for use as cropland is discussed in the soil descriptions. The capability system is discussed on pages 31 to 33. Other information is given in tables as follows:

Acreage and extent, table 1, page 8.
Estimated yields, table 2, page 34.

Engineering uses of the soils, tables 6, 7, and 8, pages 48 through 61.

Map symbol	Mapping unit	Described on page	Capability unit Symbol
Ad	Alluvial land	7	VIw-1
Am	Alluvial land, marl substratum	8	IIIw-1
As	Ashton loam	9	I-6
BaB	Benevola silty clay loam, 2 to 6 percent slopes	9	IIe-1
BcC3	Benevola clay, 6 to 12 percent slopes, severely eroded	10	IVe-1
BeC	Benevola very rocky silty clay, 6 to 12 percent slopes	10	VIs-1
BeD	Benevola very rocky silty clay, 12 to 25 percent slopes	10	VIs-1
BkB	Berks shaly silt loam, 2 to 6 percent slopes	10	IIe-10
BlB	Berks-Weikert shaly silt loams, 2 to 6 percent slopes	10	IIIe-32
BlC	Berks-Weikert shaly silt loams, 6 to 12 percent slopes	11	IVe-32
BlD	Berks-Weikert shaly silt loams, 12 to 25 percent slopes	11	VIe-31
BnB	Blairton silt loam, 2 to 6 percent slopes	12	IIIw-5
BrB	Braddock gravelly loam, 2 to 6 percent slopes	12	IIe-4
BrC	Braddock gravelly loam, 6 to 12 percent slopes	12	IIIe-4
BrC3	Braddock gravelly loam, 6 to 12 percent slopes, severely eroded	13	IVe-3
BrD	Braddock gravelly loam, 12 to 25 percent slopes	13	IVe-3
BrD3	Braddock gravelly loam, 12 to 25 percent slopes, severely eroded	13	VIe-2
BrE	Braddock gravelly loam, 25 to 35 percent slopes	13	VIe-2
CdB	Chilhowie silty clay, 2 to 6 percent slopes	13	IIIe-30
CdC	Chilhowie silty clay, 6 to 12 percent slopes	14	IVe-30
CeC3	Chilhowie clay, 6 to 12 percent slopes, severely eroded	14	VIe-1
ChC	Chilhowie and Opequon very rocky silty clays, 2 to 12 percent slopes	14	VIs-1
ClC3	Chilhowie and Opequon very rocky clays, 6 to 12 percent slopes, severely eroded	14	VIIs-1
ClD3	Chilhowie and Opequon very rocky clays, 12 to 25 percent slopes, severely eroded	14	VIIs-1
CmD	Clifton very stony silt loam, 6 to 20 percent slopes	15	VIs-2
DcC	Dekalb channery fine sandy loam, 6 to 12 percent slopes	15	IIIe-12
DcD	Dekalb channery fine sandy loam, 12 to 25 percent slopes	16	IVe-5
DcE	Dekalb channery fine sandy loam, 25 to 35 percent slopes	16	VIe-4
DcF	Dekalb channery fine sandy loam, 35 to 55 percent slopes	16	VIIe-2
DgB	Duffield silt loam, 2 to 6 percent slopes	16	IIe-1
DgC	Duffield silt loam, 6 to 12 percent slopes	16	IIIe-1
DgC3	Duffield silt loam, 6 to 12 percent slopes, severely eroded	17	IVe-1
DgD3	Duffield silt loam, 12 to 25 percent slopes, severely eroded	17	VIe-1
EdD	Edgemont very stony loam, 6 to 25 percent slopes	17	VIIs-2
EdF	Edgemont very stony loam, 25 to 50 percent slopes	17	VIIs-2
FbB	Frankstown shaly silt loam, 2 to 6 percent slopes	19	IIe-1
FbC	Frankstown shaly silt loam, 6 to 12 percent slopes	19	IIIe-1
FbC3	Frankstown shaly silt loam, 6 to 12 percent slopes, severely eroded	19	IVe-1
FbD	Frankstown shaly silt loam, 12 to 25 percent slopes	19	IVe-1
FbD3	Frankstown shaly silt loam, 12 to 25 percent slopes, severely eroded	19	VIe-1
FbE3	Frankstown shaly silt loam, 25 to 35 percent slopes, severely eroded	19	VIIe-1
FcC	Frankstown very rocky silt loam, 6 to 12 percent slopes	19	VIs-1
FcD	Frankstown very rocky silt loam, 12 to 25 percent slopes	19	VIs-1
FcD3	Frankstown very rocky silt loam, 12 to 25 percent slopes, severely eroded	19	VIIs-1
HbB	Hagerstown silt loam, 2 to 6 percent slopes	21	IIe-1
HbC	Hagerstown silt loam, 6 to 12 percent slopes	21	IIIe-1
HcC	Hagerstown extremely rocky silt loam, 5 to 25 percent slopes	21	VIIs-4
HeC3	Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	21	IVe-1
HfB	Hagerstown and Frederick cherty silt loams, 2 to 6 percent slopes	22	IIe-1
HfC	Hagerstown and Frederick cherty silt loams, 6 to 12 percent slopes	22	IIIe-1
HgB	Hagerstown and Frederick very rocky silt loams, 2 to 6 percent slopes	22	VIs-1
HgC	Hagerstown and Frederick very rocky silt loams, 6 to 12 percent slopes	23	VIs-1
HgD	Hagerstown and Frederick very rocky silt loams, 12 to 25 percent slopes	23	VIs-1
HhC3	Hagerstown and Frederick cherty silty clay loams, 6 to 12 percent slopes, severely eroded	24	IVe-1
HlC3	Hagerstown and Frederick very rocky silty clay loams, 6 to 12 percent slopes, severely eroded	24	VIs-1
HlD3	Hagerstown and Frederick very rocky silty clay loams, 12 to 25 percent slopes, severely eroded	24	VIIs-1
Hn	Huntington silt loam	24	IIw-6
Ho	Huntington silt loam, local alluvium	25	I-6
LaC	Laidig gravelly loam, 6 to 12 percent slopes	25	IIIe-4
LaD	Laidig gravelly loam, 12 to 25 percent slopes	25	IVe-3
LbC	Laidig very stony loam, 6 to 12 percent slopes	25	VIs-2
LbD	Laidig very stony loam, 12 to 25 percent slopes	25	VIs-2
Lf	Landes fine sandy loam	26	IIw-6
Ln	Lindside silt loam	26	IIw-7
Lo	Lindside silt loam, local alluvium	27	IIw-7
Ma	Marl pit	27	-------
Me	Melvin silt loam	27	IIIw-1
MhB	Monongahela silt loam, 2 to 6 percent slopes	28	IIe-13
Qu	Quarries	28	-------
SrF	Steep rock land	29	VIIIs-1
WeC3	Weikert shaly silt loam, 6 to 12 percent slopes, severely eroded	30	VIe-31
WeD3	Weikert shaly silt loam, 12 to 25 percent slopes, severely eroded	30	VIIe-3
WeF	Weikert shaly silt loam, 25 to 45 percent slopes	30	VIIe-3

461-488 O - 73 (Face o.p. maps)

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

BOUNDARIES

- National or state
- County
- Limit of detailed soil survey
- Reservation
- Land grant
- Small park, cemetery, airport

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water) (w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

SOIL LEGEND

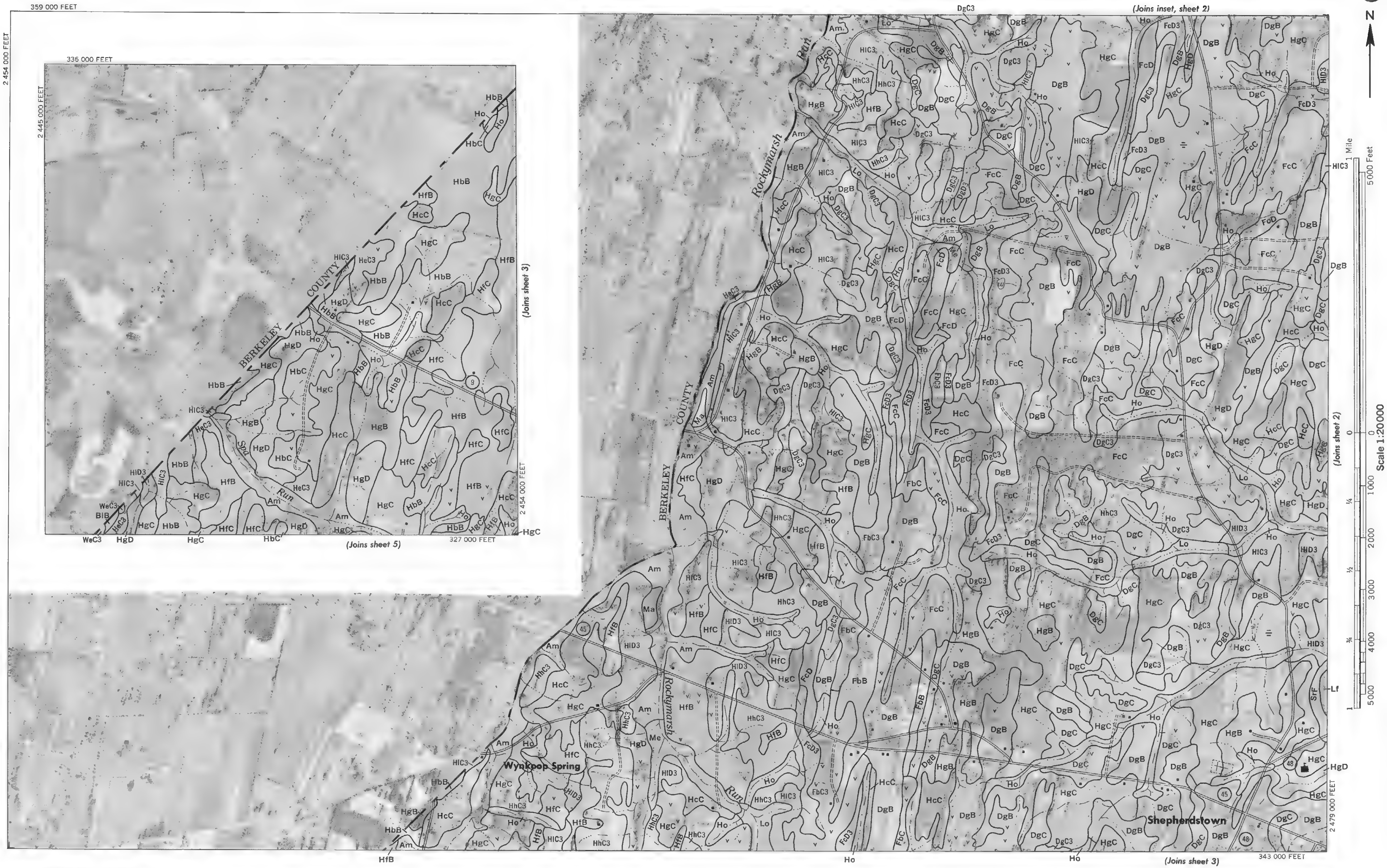
The first capital letter is the initial one of the soil name. A second capital letter, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. A final number, 3, in the symbol shows that the soil is severely eroded.

SYMBOL	NAME
Ad	Alluvial land
Am	Alluvial land, marl substratum
As	Ashton loam
BaB	Benevola silty clay loam, 2 to 6 percent slopes
BcC3	Benevola clay, 6 to 12 percent slopes, severely eroded
BeC	Benevola very rocky silty clay, 6 to 12 percent slopes
BeD	Benevola very rocky silty clay, 12 to 25 percent slopes
BkB	Berks shaly silt loam, 2 to 6 percent slopes
BlB	Berks-Weikert shaly silt loams, 2 to 6 percent slopes
BlC	Berks-Weikert shaly silt loams, 6 to 12 percent slopes
BlD	Berks-Weikert shaly silt loams, 12 to 25 percent slopes
BnB	Blairton silt loam, 2 to 6 percent slopes
BrB	Braddock gravelly loam, 2 to 6 percent slopes
BrC	Braddock gravelly loam, 6 to 12 percent slopes
BrC3	Braddock gravelly loam, 6 to 12 percent slopes, severely eroded
BrD	Braddock gravelly loam, 12 to 25 percent slopes
BrD3	Braddock gravelly loam, 12 to 25 percent slopes, severely eroded
BrE	Braddock gravelly loam, 25 to 35 percent slopes
CdB	Chilhowie silty clay, 2 to 6 percent slopes
CdC	Chilhowie silty clay, 6 to 12 percent slopes
CeC3	Chilhowie clay, 6 to 12 percent slopes, severely eroded
ChC	Chilhowie and Opequon very rocky silty clays, 2 to 12 percent slopes
ClC3	Chilhowie and Opequon very rocky clays, 6 to 12 percent slopes, severely eroded
ClD3	Chilhowie and Opequon very rocky clays, 12 to 25 percent slopes, severely eroded
CmD	Clifton very stony silt loam, 6 to 20 percent slopes
DcC	Dekalb channery fine sandy loam, 6 to 12 percent slopes
DcD	Dekalb channery fine sandy loam, 12 to 25 percent slopes
DcE	Dekalb channery fine sandy loam, 25 to 35 percent slopes
DcF	Dekalb channery fine sandy loam, 35 to 55 percent slopes
DgB	Duffield silt loam, 2 to 6 percent slopes
DgC	Duffield silt loam, 6 to 12 percent slopes
DgC3	Duffield silt loam, 6 to 12 percent slopes, severely eroded
DgD3	Duffield silt loam, 12 to 25 percent slopes, severely eroded
EdD	Edgemont very stony loam, 6 to 25 percent slopes
EdF	Edgemont very stony loam, 25 to 50 percent slopes
FbB	Frankstown shaly silt loam, 2 to 6 percent slopes
FbC	Frankstown shaly silt loam, 6 to 12 percent slopes
FbC3	Frankstown shaly silt loam, 6 to 12 percent slopes, severely eroded
FbD	Frankstown shaly silt loam, 12 to 25 percent slopes
FbD3	Frankstown shaly silt loam, 12 to 25 percent slopes, severely eroded
FbE3	Frankstown shaly silt loam, 25 to 35 percent slopes, severely eroded
FcC	Frankstown very rocky silt loam, 6 to 12 percent slopes
FcD	Frankstown very rocky silt loam, 12 to 25 percent slopes
FcD3	Frankstown very rocky silt loam, 12 to 25 percent slopes, severely eroded
HbB	Hagerstown silt loam, 2 to 6 percent slopes
HbC	Hagerstown silt loam, 6 to 12 percent slopes
HcC	Hagerstown extremely rocky silt loam, 5 to 25 percent slopes
HeC3	Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded
HfB	Hagerstown and Frederick cherty silt loams, 2 to 6 percent slopes
HfC	Hagerstown and Frederick cherty silt loams, 6 to 12 percent slopes
HgB	Hagerstown and Frederick very rocky silt loams, 2 to 6 percent slopes
HgC	Hagerstown and Frederick very rocky silt loams, 6 to 12 percent slopes
HgD	Hagerstown and Frederick very rocky silt loams, 12 to 25 percent slopes
HnC3	Hagerstown and Frederick cherty silty clay loams, 6 to 12 percent slopes, severely eroded
HlC3	Hagerstown and Frederick very rocky silty clay loams, 6 to 12 percent slopes, severely eroded
HlD3	Hagerstown and Frederick very rocky silty clay loams, 12 to 25 percent slopes, severely eroded
Hn	Huntington silt loam
Ho	Huntington silt loam, local alluvium
LaC	Laidig gravelly loam, 6 to 12 percent slopes
LaD	Laidig gravelly loam, 12 to 25 percent slopes
LbC	Laidig very stony loam, 6 to 12 percent slopes
LbD	Laidig very stony loam, 12 to 25 percent slopes
Lf	Landes fine sandy loam
Ln	Lindside silt loam
Lo	Lindside silt loam, local alluvium
Ma	Marl pit
Me	Melvin silt loam
MhB	Monongahela silt loam, 2 to 6 percent slopes
Qu	Quarries
SrF	Steep rock land
WeC3	Weikert shaly silt loam, 6 to 12 percent slopes, severely eroded
WeD3	Weikert shaly silt loam, 12 to 25 percent slopes, severely eroded
WeF	Weikert shaly silt loam, 25 to 45 percent slopes

1

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

JEFFERSON COUNTY, WEST VIRGINIA NO. 1



Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum

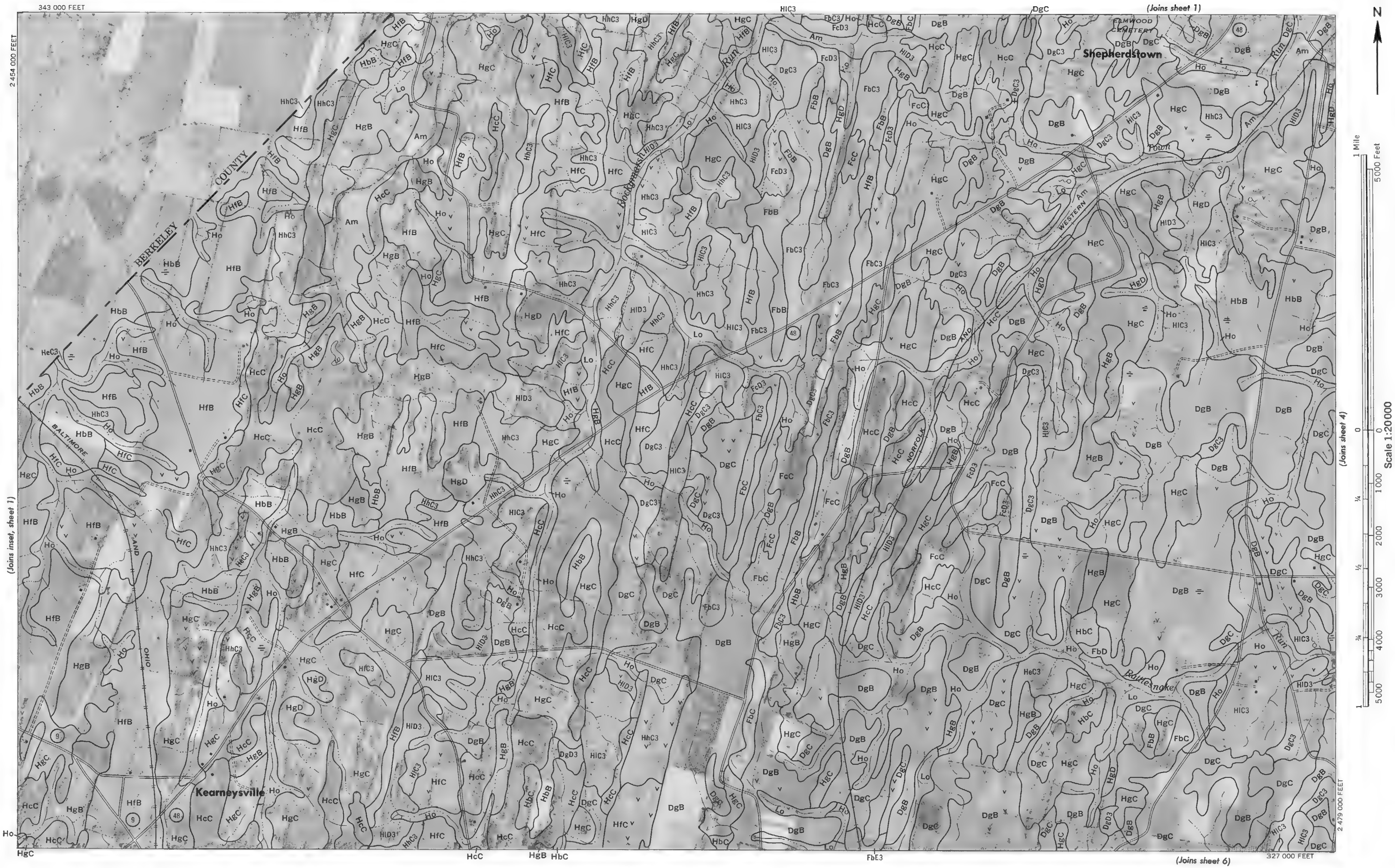
JEFFERSON COUNTY WEST VIRGINIA NO. 2

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

3

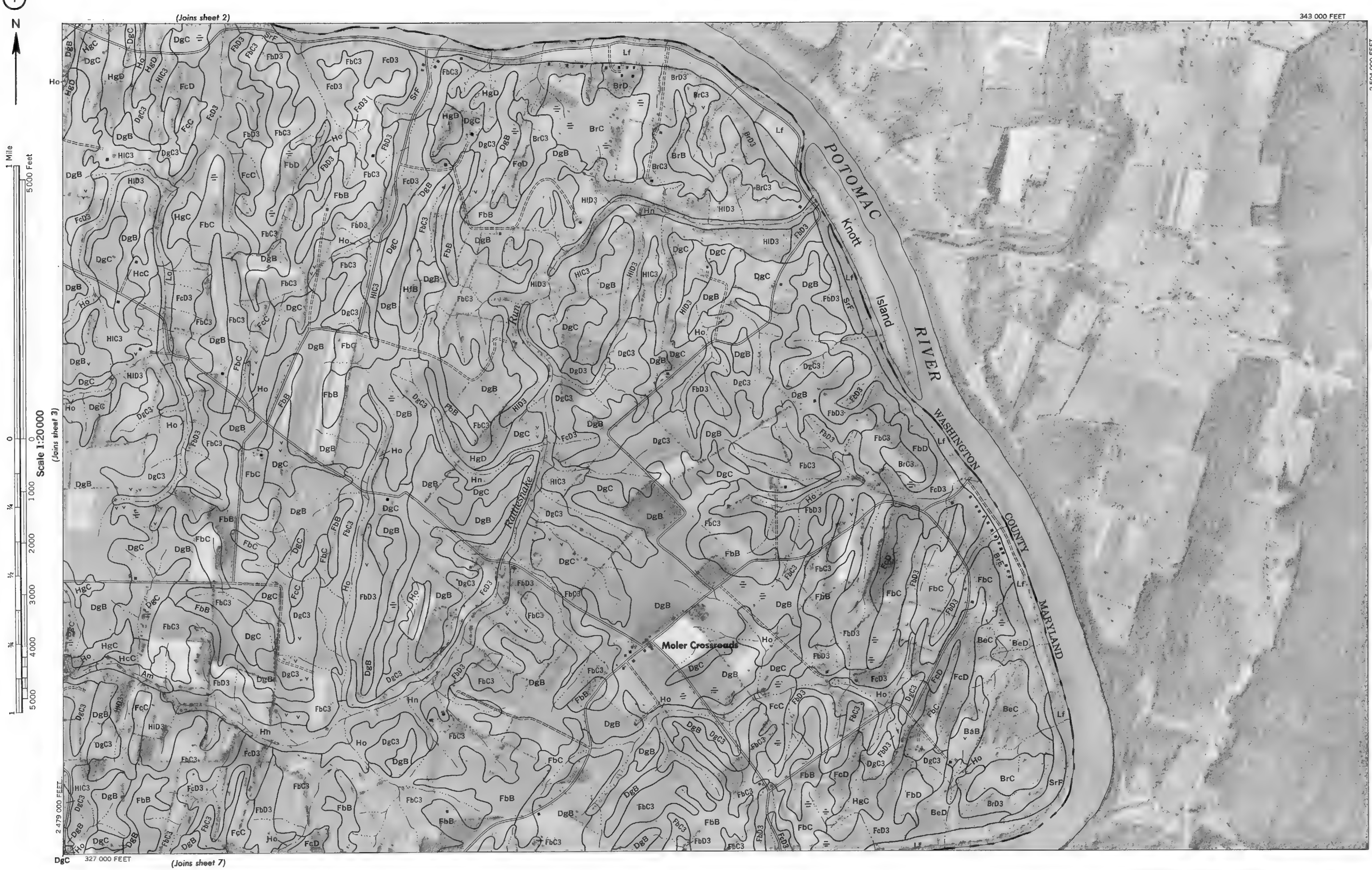
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

JEFFERSON COUNTY, WEST VIRGINIA NO. 3



Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA — SHEET NUMBER 4



JEFFERSON COUNTY, WEST VIRGINIA NO. 4

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA NO. 5

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

(6)

N

(Joins sheet 3)

327 000 FEET

2 479 000 FEET

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 5)

(Joins sheet 7)

2 454 000 FEET

311 000 FEET

(Joins sheet 9)

JEFFERSON COUNTY, WEST VIRGINIA NO. 6

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

7

N

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

JEFFERSON COUNTY, WEST VIRGINIA NO. 7

327 000 FEET

(Joins sheet 4)

2 479 000 FEET

(Joins sheet 6)

(Joins sheet 10)

2 504 000 FEET

311 000 FEET

1 Mile

5000 Feet

Scale 1:20000

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA — SHEET NUMBER 8

JEFFERSON COUNTY, WEST VIRGINIA NO. 8

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA — SHEET NUMBER 9

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

JEFFERSON COUNTY WEST VIRGINIA NO. 9

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

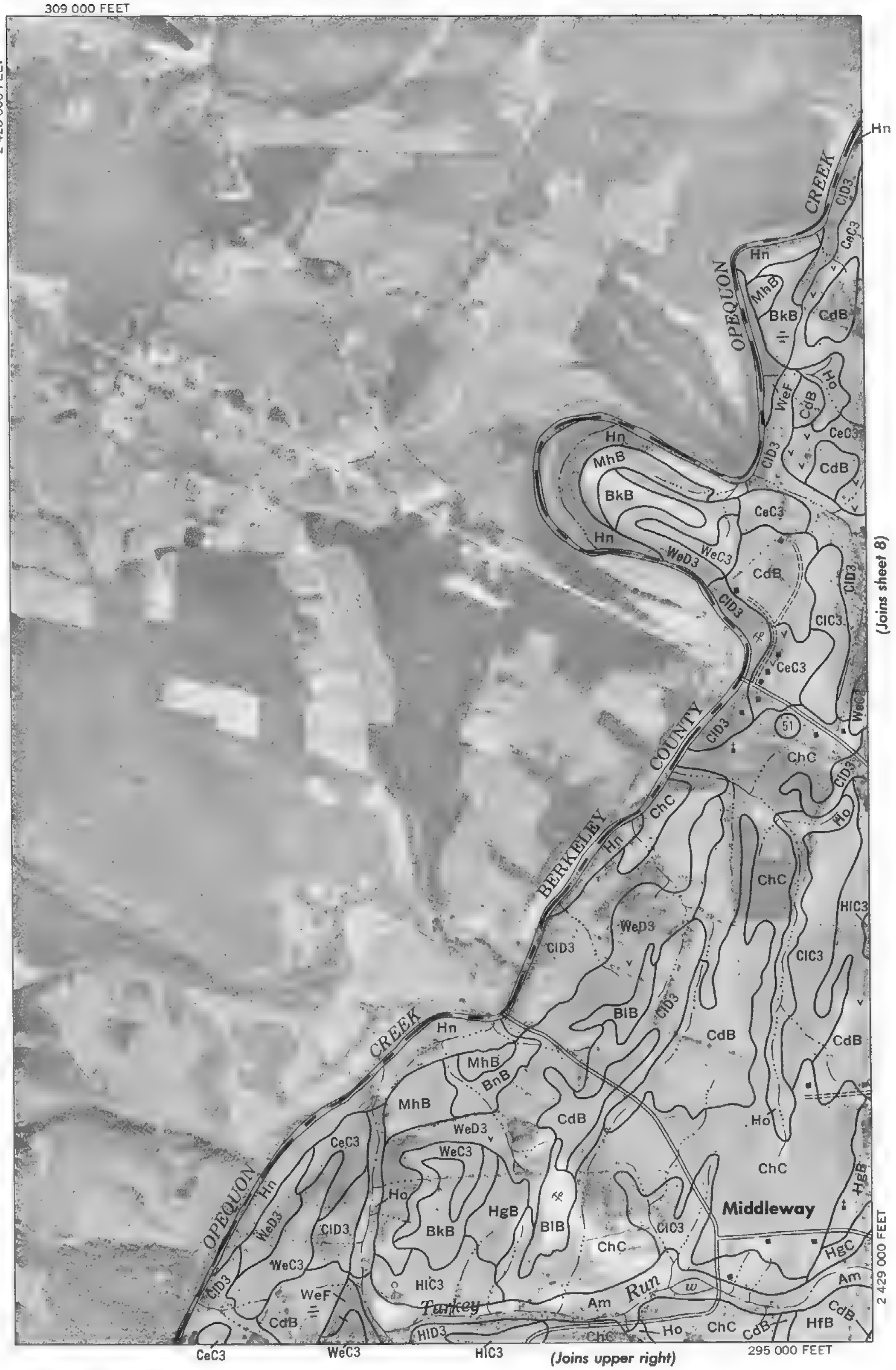
JEFFERSON COUNTY, WEST VIRGINIA NO. 10

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

JEFFERSON COUNTY, WEST VIRGINIA NO. 11



N

Scale 1:20000

1 Mile, ¾, ½, ¼, 0

5000 Feet, 4000, 3000, 2000, 1000, 0

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA NO. 12

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

JEFFERSON COUNTY, WEST VIRGINIA NO. 13

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA NO. 14

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA NO. 15

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

16

N

(Joins sheet 13)

1 Mile
5000 Feet
Scale 1:20000
0 1000 2000 3000 4000 5000
0 ¼ ½ ¾ 1

(Joins sheet 15)

(Joins sheet 17)

(Joins sheet 19)

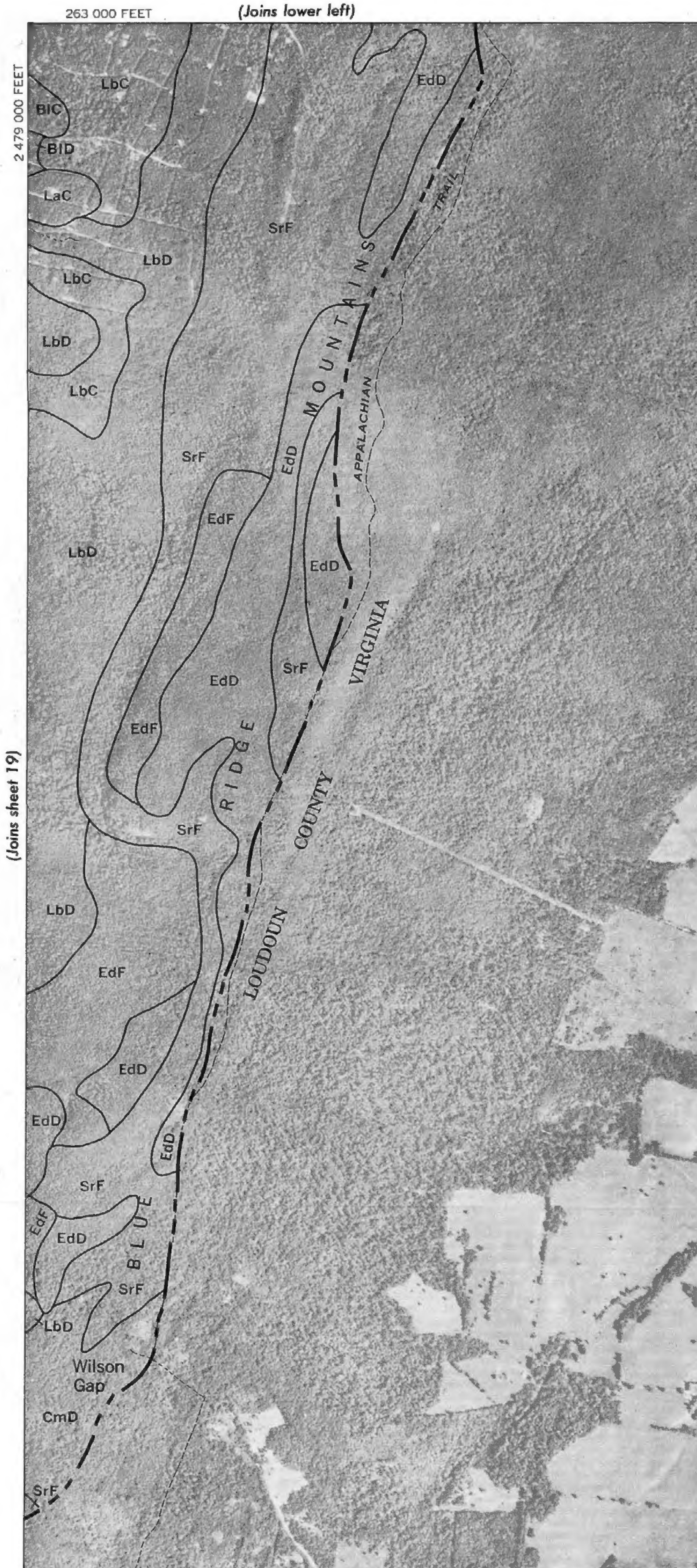
JEFFERSON COUNTY, WEST VIRGINIA NO. 16

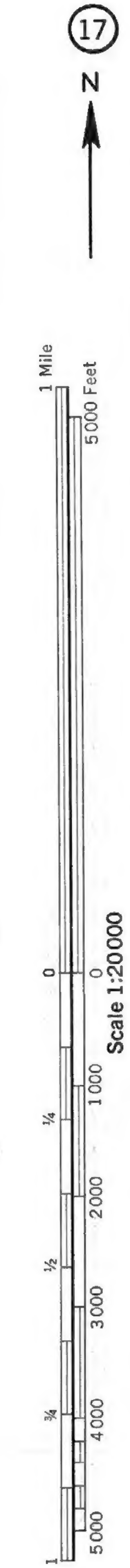
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

JEFFERSON COUNTY, WEST VIRGINIA NO. 17





Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA NO. 18

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

19

Scale 1:20000

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

JEFFERSON COUNTY, WEST VIRGINIA NO. 19

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.

JEFFERSON COUNTY, WEST VIRGINIA — SHEET NUMBER 20

N

1 Mile
5000 Feet
0
0
Scale 1:20000
1000
¼
2000
½
3000
¾
4000
1
5000

JEFFERSON COUNTY, WEST VIRGINIA NO. 20

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1967 aerial photographs. Grid values based on West Virginia plane coordinate system, north zone. 1927 North American datum.